The Cotton Gin and Oil Mill

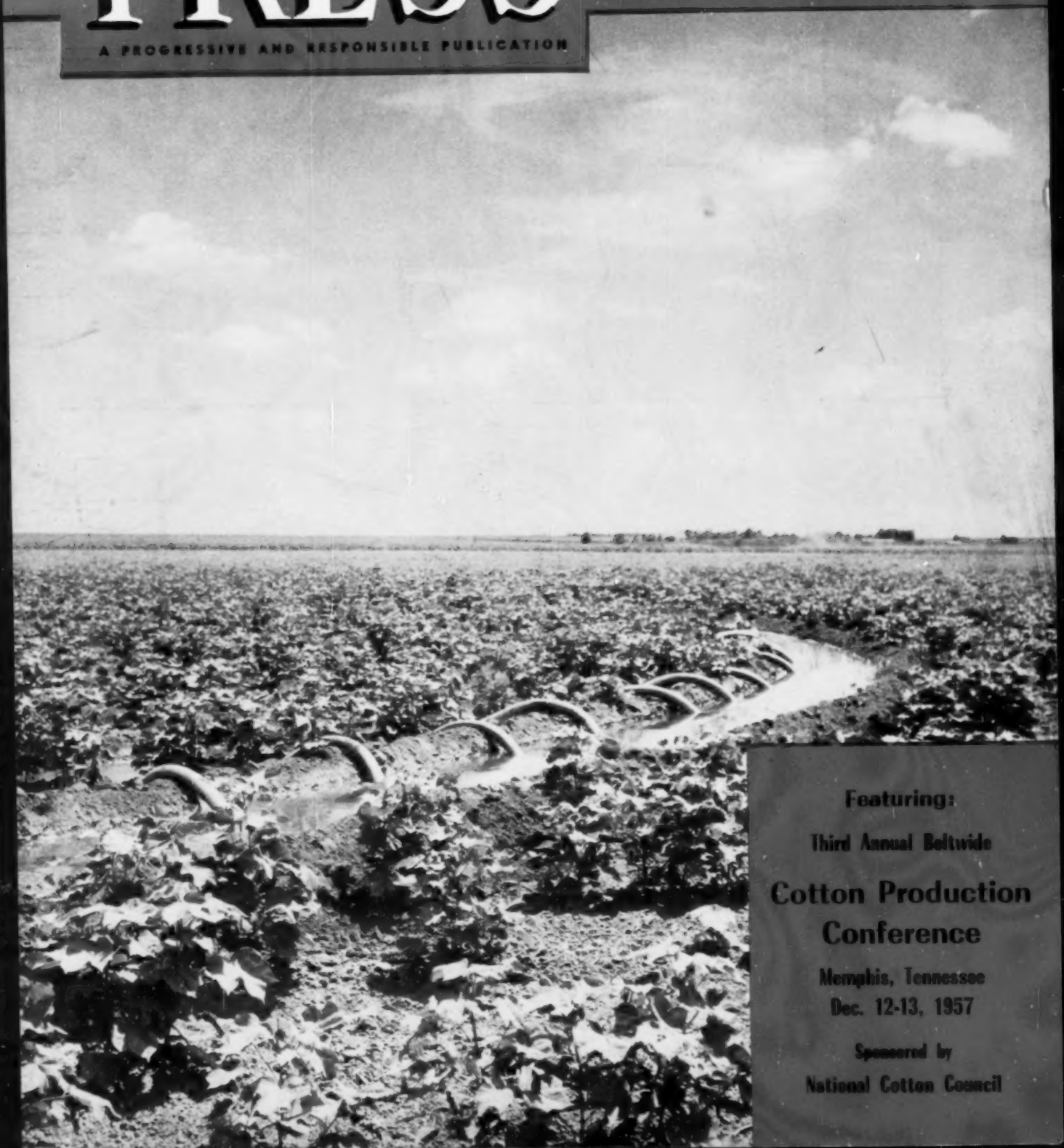
PRESS

DECEMBER 28, 1957

58th year

THE MAGAZINE OF THE COTTON GINNING AND OILSEED PROCESSING INDUSTRIES

A PROGRESSIVE AND RESPONSIBLE PUBLICATION



Featuring:

Third Annual Beltwide

Cotton Production Conference

Memphis, Tennessee

Dec. 12-13, 1957

Sponsored by

National Cotton Council

Entered as Second-class matter February 4, 1905, at the Post Office at Dallas, Texas, Under Act of Congress of March 3, 1897

Wishing you a bountiful New Year

Elden Taylor

A. T. FERRELL AND COMPANY SAGINAW, MICHIGAN

ON OUR COVER:

Irrigation was a lifesaver for many farmers growing cotton in recent years, and not even the record wet season of 1957 could alter the importance of this production practice to the cotton industry. The cover picture, taken in Lynn County, Texas, fits in well with the discussions at the Beltwide Cotton Production Conference which are summarized in this issue of The Cotton Gin and Oil Mill Press.

Photo by I. G. Holmes

VOL. 58 DEC. 28, 1957 NO. 26

The Cotton Gin and Oil Mill PRESS . . .

READ BY COTTON GINNERS, COTTONSEED CRUSHERS AND OTHER OILSEED PROCESSORS FROM CALIFORNIA TO THE CAROLINAS

★ ★ ★

OFFICIAL MAGAZINE OF:

National Cottonseed Products Association

National Cotton Ginners' Association

Alabama Cotton Ginners' Association

Arizona Ginners' Association

Arkansas-Missouri Ginners' Association

California Cotton Ginners' Association

The Carolinas Ginners' Association

Georgia Cotton Ginners' Association

Louisiana-Mississippi Cotton Ginners' Association

New Mexico Cotton Ginners' Association

Oklahoma Cotton Ginners' Association

Tennessee Cotton Ginners' Association

Texas Cotton Ginners' Association

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THE COTTON GIN AND OIL MILL PRESS *is the Official Magazine of the foregoing associations for official communications and news releases, but the associations are in no way responsible for the editorial expressions or policies contained herein.*

THE COTTON GIN AND OIL MILL PRESS

WALTER B. MOORE
Editor

HELEN TROY
Editorial Assistant

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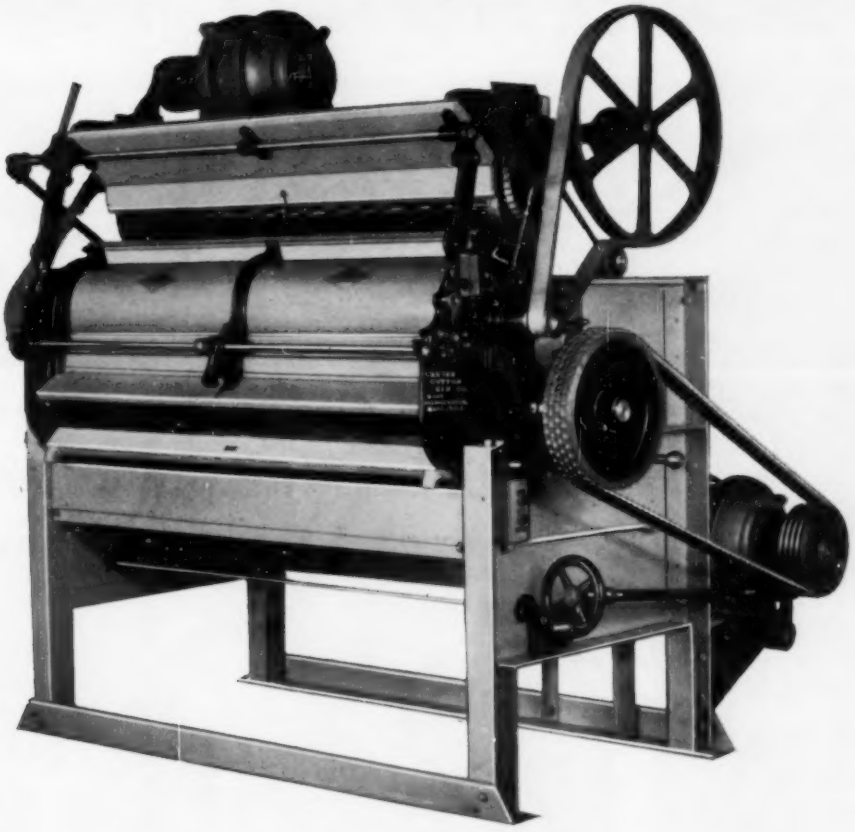

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Research Improves Ginning

MESILLA PARK LABORATORY: Saw ginning laboratory, offices and fiber research laboratory in foreground, roller ginning unit in background.

Part II–Southwestern Laboratory

FIBER LABORATORY technicians study effects of ginning on products.

A HIGHLY TRAINED STAFF is required at the Southwestern Laboratory to carry out the ginning research experiments conducted there.

ON DEC. 17, 1949, the Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N.M., was dedicated to study the ginning needs of Southwestern cotton.

This area includes California, Arizona, New Mexico, and parts of West Texas. Natural rainfall is very low and practically all cotton is produced under irrigation. Consequently, ginning requirements and fiber properties are quite different from rain-grown cotton. They, therefore, require scientific research in ginning and its related phases for maximum returns to producers.

Most of the cottons grown are Upland varieties from original Acala cotton introduced from Mexico in 1906. California's Acala 4-42 cotton usually has staple lengths around 1-1/16 to 1-3/32 inches and fineness readings about 4.0 to 4.7 Micronaire units. Arizona's Acala 44 usually has staple lengths around 1-1/32 to 1-1/16 inches and Micronaire units about 3.9 to 4.5. New Mexico's Acala 1517C, also grown in parts of Texas, has staple lengths from 1-3/32 to 1-5/32 inches and Micronaire units from 3.5 to 4.2. These Acalas were adapted to their respective areas of growth and the resulting ginning and fiber chartcteristics vary among the varieties.

Arizona, New Mexico, and the El Paso area of Texas also produce the well-known American-Egyptian cotton, Pima S-1. This extra long fine cotton presents an entirely different ginning problem from Upland cotton and must be roller ginned. Thus, the Southwestern Cotton Ginning Research Laboratory is engaged in a program which includes both saw and roller ginning.

During the first few years, ginning tests were run to determine the ginning characteristics of these cottons because data from rain-grown cottons might not apply. It was found that, under these dry climatic conditions, these fine, strong, and long Upland cottons gin at a substantially faster rate than rain-grown cotton or at a rate of 7.5 to 9 pounds of lint per saw per hour. They are extremely dry, they have a high cleaning efficiency, and they are very susceptible to neppiness.

A three-year study of nep formation in gins disclosed that all of the ginning machinery contributed toward making neps. The more cleaning and extracting that was used, the more neps increased. However, in all set-ups the gin stand itself was found to be the chief offender —it contributed about 60 percent. The accumulated effect of cleaners, extractors, feeders, lint cleaners, piping and auxiliary equipment contributed the other 40 percent. A long-range study is now being initiated to try to find out just how and where these neps are formed and what can be done to eliminate them.

Moderate drying temperatures are helpful toward obtaining good grades. New Mexico cotton normally comes to

By VICTOR L. STEDRONSKY

This is the second of a series of articles, written exclusively for The Press, summarizing research at the ginning laboratories of U.S. Department of Agriculture. The first article was published Sept. 21, 1957, and discussed the Laboratory at Clemson, S.C. The author of the accompanying article is Engineer in Charge of the Southwestern Laboratory, Agricultural Engineering Research Division, Agricultural Research Service, USDA.

the gin at five to seven percent moisture, except for early morning, dew-laden pickings, or after showers. Arizona cottons require slightly more drying due to high relative humidity climate and ranker growths of cotton. In California, more cleaning is required because of the high percentage of machine-picked cotton, and more drying is required because of fogs and dew-laden cotton.

Acale cottons not only gin faster but also clean very well. New Mexico gins seldom are equipped with more than one drier, two cleaners, extractor feeders, and lint cleaners in their ginning setup.

• **Static Electricity Problem** — Static electricity has long been a serious problem in Western gins. A five-year study of this phenomena has revealed some very interesting information. Atmospheric conditions of temperature and humidity, moisture content of cotton, temperature of cotton, gin machinery arrangements, and other elements contribute to the forming of static.

Moisture, applied in sprays or vapor to the cotton, seems to be successful in reducing static in most instances. However, application may be needed at several points in the ginning system. Results of recent experiments using liquid anti-static chemicals applied to the seed cotton at the suction telescope are encouraging, and one has been selected for commercial gin trials. These chemicals are expensive, so should be applied only when static is troublesome.

The studies proved that the use of grounding and bonding of gin machinery served no useful purpose in controlling static. Experiments showed that the static charge is in the cotton itself, and not in the machinery, and that the grounding of equipment did not ground the cotton or remove the static charge. A modern gin is so well grounded that wires connected to the machinery did not help. As a result of these tests, insurance rates have been reduced in Texas, at a saving of approximaately $75,000 for Texas ginners annually. When other states reduce their rates, it will be a tremendous saving to ginners in the U.S.

Another by-product of this study is that we are now quite certain that static sparks do not start gin fires. Experiments were conducted and no fires resulter from static. Yet a sulphur-

(Continued on Page 50)

Best Wishes for A Better Year

Memories of 1957 will linger long past the New Year—for cotton farmers and ginners it probably will go down into history as one of the worst years in modern times.

There is nothing we can do to change the thing that happened in the past, so let all of us in the cotton industry join together and try to get a sound and realistic cotton program for the future.

Prosperity for this country and for cotton can be built only upon an expanded economy; and it is up to all of us to work for this. The officers and directors of the National Cotton Ginners' Association have long recognized this and have been working toward this goal.

On behalf of all the officers and directors of the Association, let me extend best wishes for a Happy New Year to all.

By Joe Fleming,
President,
National Cotton Ginners' Association

• **Old Programs Doomed** — Handwriting is on the wall for old farm programs. Patched and propped-up legislation in being since cotton brought five cents per pound is as out-dated as isolationism.

Cotton could be the No. 1 domestic issue at this session of Congress. Both in USDA policy-mapping and on Capitol Hill, cotton, among all farm commodities, seems slated for top billing. Here's why:

(1) USDA top brass must break the "cotton barrier" in Congress before new laws can be written for any crop. Many Southern lawmakers don't trust Benson, and want a new cotton program passed and signed before they talk something new for the Corn Belt.

(2) An 11-million bale crop and high exports may, by law, force USDA to up 1958-crop supports. Benson will go all out to prevent this.

(3) Except for rains, acre yields have been at an all-time high. This is evidence that acreage isn't an effective tool for curbing production.

(4) Acreage controls have been tightened to the point that one out of every three allotments is for less than five acres.

(5) Any good which growers have derived from the Soil Bank has been offset by harm done to Southern businessmen.

(6) Only tremendous Treasury subsidy holds cotton exports above the five million bale mark. Southern lawmakers are pressed to justify this.

More than 50 bills proposing solutions await Congress. These are carryovers from last session. And more are in the drafting stage.

Level of domestic prices is the really big issue. Backers of nearly every major bill, along with USDA, agree that: Cotton grown for export should not be supported above the world market level; USDA must continue, at least for the present, some program of acreage allotments and marketing quotas; and, once surpluses are moved, allotments should be substantially increased.

• **Acreage Reserve Dying** — Less than two years after its conception, the acreage reserve is dying. A post-mortem will show abuse and neglect as the cause. Benson says he's ready to wash his hands of it soon as '58 crops are in. Congress gave notice last session that this was its view, also.

A giant "land retirement" program is being plugged instead. A greatly souped-up conservation reserve program —with payments more nearly in line with the acreage reserve—is what many want. USDA has ordered four states (Tennessee, Nebraska, Illinois, and Maine) to advertise for bids from farmers. Operators are asked to name their own price—subject to USDA okay—for retiring their entire farm for five years or longer.

If the 30-day trial in these states is successful, USDA plans to expand the bid scheme to all states prior to 1958 planting. Southeastern states, where small, marginal farms abound, will get special emphasis. Officials say, off the record, that twice as many cotton acres might be taken out of production this way, as under the acreage reserve program.

• More Area Meetings Held by Crushers

AREA meetings of the Texas Cottonseed Crushers' Association were held in Greenville, Dec. 17, and Hillsboro, Dec. 19. There was excellent attendance at each meeting. Industry problems and Association activities were discussed.

Three additional area meetings have been arranged for Quanah, Jan. 21; Lubbock, Jan. 22 and Abilene, Jan. 23.

• Farm Bureau Asks New Cotton Plan

COTTON would have an export subsidy in the future, and growers in 1958 would have a choice of federal programs under plans recommended to American Farm Bureau directors by AFB representatives from Cotton States. Representatives adopted their recommendations at a Dallas meeting, Dec. 19-20.

Their long-range plan would permit shippers to buy cotton from growers at not less than 75 percent of parity, selling abroad at the world price. A subsidy would make up the difference. This plan, which includes other provisions, is proposed for 1959.

In 1958, farmers would choose between present support prices and acreage allotments, and 25 percent more allotment but support prices of only 70 percent of parity.

Soybean Committee Named

Southeastern Cottonseed Crushers' Association Atlanta, has named a committee to work on increasing soybean production.

President C. H. Lumpkin heads the Georgia committee, which includes J. P. George, A. J. Maguire, Jr., and C. M. Scales.

Alabama's committee, headed by Vice-President M. H. Conner, consists of J. H. Bryson, J. V. Kidd, T. H. Golson, J. M. Sewell and Scales.

■ **CHARLES McNEIL will retire March 1 after 28 years as manager of Mississippi Federated Cooperatives. ERNEST G. SPIVEY, Jackson, succeeds him and A. E. BEALL becomes assistant.**

Terrell Appointed

L. E. TERRELL has been named district sales manager of the new California District of Continental Gin Service Co., with headquarters in Tulare. G. P. McCarty, vice-president of the Western District of Continental Gin Co., announced his appointment. Terrell has had many years of experience in the gin industry. Continental Gin Service Co. recently increased its sales personnel for the California District and is enlarging repair parts and service facilities at Tulare.

Cotton Cases Dismissed

The federal government on Dec. 26 dismissed its criminal action against a group of cotton merchants and terminated its civil case in the matter, involving bidding on CCC cotton. Merchants hailed the action as vindication of their practices and of "the entire cotton trade."

■ **J. D. FLEMING, National Cottonseed Products Association executive vice-president, has been appointed a member of the Cotton and Cottonseed Research and Marketing Advisory Committee. As a member of the Committee, he succeeds T. H. GREGORY who has served since the group was established in 1946.**

November Mellorine Report

November production of mellorine and other frozen desserts made with fats and oils other than milk-fat was 1,785,000 gallons, or at about the same level as the November output last year, but seven percent below the same month in 1955. In the first 11 months of this year mellorine production was down four percent from the total for the same month last year and two percent below the quantity frozen in the 1955 January-November period, USDA reports.

November ice cream production in the U.S., estimated at 41,275,000 gallons, was six percent smaller than the record November output a year ago, but was 10 percent above the 1951-55 average for the month.

• Research on Cotton And Fats Sought

RESEARCH to improve serviceability of cotton fabrics and to determine the precise role of fat in human nutrition were among recommendations made recently by USDA's Home Economics Research Advisory Committee.

The fat studies were recommended because of the growing evidence of a relationship between fats and many aspects of human metabolism.

New information about the serviceability of new chemically-treated cotton clothing and household textiles in laundering and dry cleaning would be provided by the fabric studies, the committee said. Present evidence, members noted, indicates that some of the new "minimum care" finishes applied to cotton are removed by laundering. Simple tests to predict finish serviceability are needed, the committee agreed, and finishes available for home application might be developed.

The committee's report is available from Office of Administrator, ARS-USDA, Washington 25.

O. M. Beckham, Osceola Superintendent, Dies

O. M. Beckham, superintendent of Osceola Products Co., Osceola, Ark., died Dec. 15 in a Memphis hospital. He served as president of Tri-States Oil Mill Superintendents' Association in 1956.

He leaves his wife, Mrs. LaVern McGrath Beckham of Osceola; a daughter, Miss Marion Beckham of Osceola; his father, Harry Beckham of Memphis and a sister.

■ C. R. MAESE, ginner at Mesilla Co-op Gin, was in one of the illustrations for an article, "Marketing New Mexico Cotton," in the December issue of New Mexico Extension News.

Murray Representatives Meet in Dallas

MURRAY CO. representatives are shown here as they gathered at the Dallas plant in December for the annual general sales meeting, at which they discussed plans covering the general sales policy for 1958.

Calcot Has New Facilities

New, enlarged facilities of Calcot, Inc., Bakersfield, Calif., are described and pictured in a new booklet issued by the cotton cooperative.

J. R. Kennedy, general manager, points out that the facilities are provided "to maintain highest quality service in the face of sharply increased volume."

Du Pont Plans Research

Du Pont Co. has announced that it is putting $15 million into its 30-year-old program of fundamental research. The program seeks scientific knowledge without regard to specific commercial objectives.

New Bulletin

'GRAIN GRADING PRIMER' PUBLISHED BY USDA

USDA has published a "Grain Grading Primer," designed for those interested in handling grain on a grade and quality basis and for marketing sturents.

The bulletin also discusses a number of farm practices that lower the quality and grade of grain. Methods and apparatus useful in measuring the value of grain are described and information on how to inspect and grade grain is given.

This revision covers changes in the grades for soybeans, effective Sept. 1, 1955; barley, effective July 1, 1956; wheat, effective June 15, 1957.

SRA-AMS-No. 177, Official Grain Standards of the United States, is available from the Superintendent of Documents, Washington, at 35 cents a copy.

John P. Falconer, Former Chase Manager, Dies

John P. Falconer, 48, Southwestern branch manager of Chase Bag Co. from 1941 until he retired this year, died at his home in Dallas on Dec. 15. He was active in church and civic affairs, and widely known for his golfing ability.

Survivors include his wife; two sons, John P. Falconer, Jr., and James Falconer; a daughter, Bonnie Falconer, and his father, John Falconer, Sr., all of Dallas; a brother, W. E. Falconer of Kodiak, Alaska, and a sister, Mrs. Richard Warner of Tyler.

Pierce Gins 50 Years

L. F. Pierce is observing his fiftieth season as a ginner at Farmers' Gin, Jackson, N.C. His son, L. F., Jr., is associated with him at the gin.

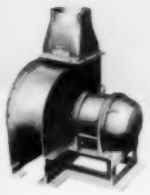
Young Farmers Visit

More than 60 foreign young farmer trainees visited San Joaquin Valley cotton gins and other industry plants last fall.

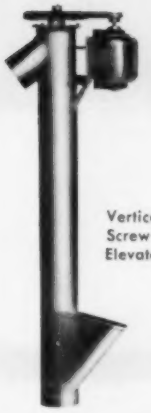
MODERNIZE YOUR MILL WITH KELLY DUPLEX

DEPENDABLE MILL EQUIPMENT

for top service and economy . . . increased profits!



Grain Blower & Exhaust Fan

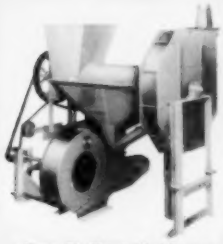


Vertical Screw Elevator

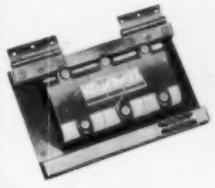
Cob Crusher for making Poultry Litter

Corn Cutter and Grader with Aspirator

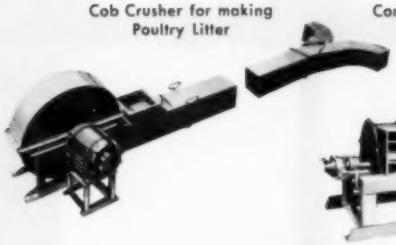
Vertical Feed Mixer ½ to 5 tons and larger



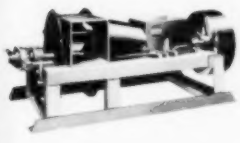
Corn Sheller with blowers for grain and cobs



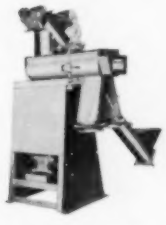
Magnetic Separator protects mill machinery



Forced Air Carloader with motor or belt drive



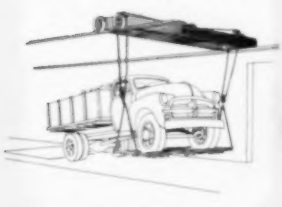
Regular and Pitless Corn Shellers



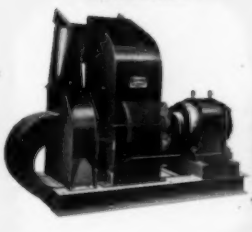
Twin Molasses Mixer

Corn Scalper with or without air cleaner

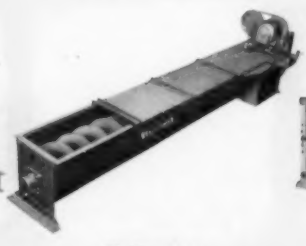
Chain Drag in double and single geared types



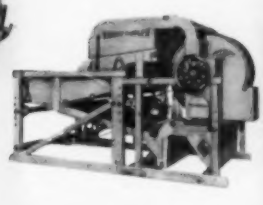
Electric Truck Hoist cuts handling costs



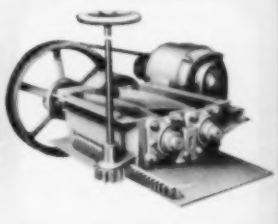
Hammermills 12", 16", 20", 24" sizes



Pit Auger or Ear Corn Conveyor

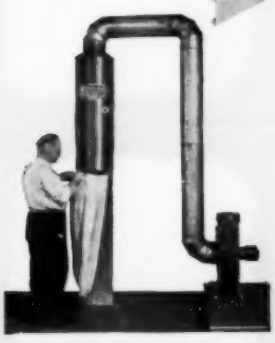


Gyrating Cleaner



Corn Crusher and Feed Regulator

Grain Feeder



Electric Bag Cleaner

The Duplex Mill & Manufacturing Company Springfield, Ohio

Yes, I'm interested in the KELLY DUPLEX machinery checked at the right. Please send me full information on these machines without any obligation.

NAME_____

FIRM_____

CITY_____ STATE_____

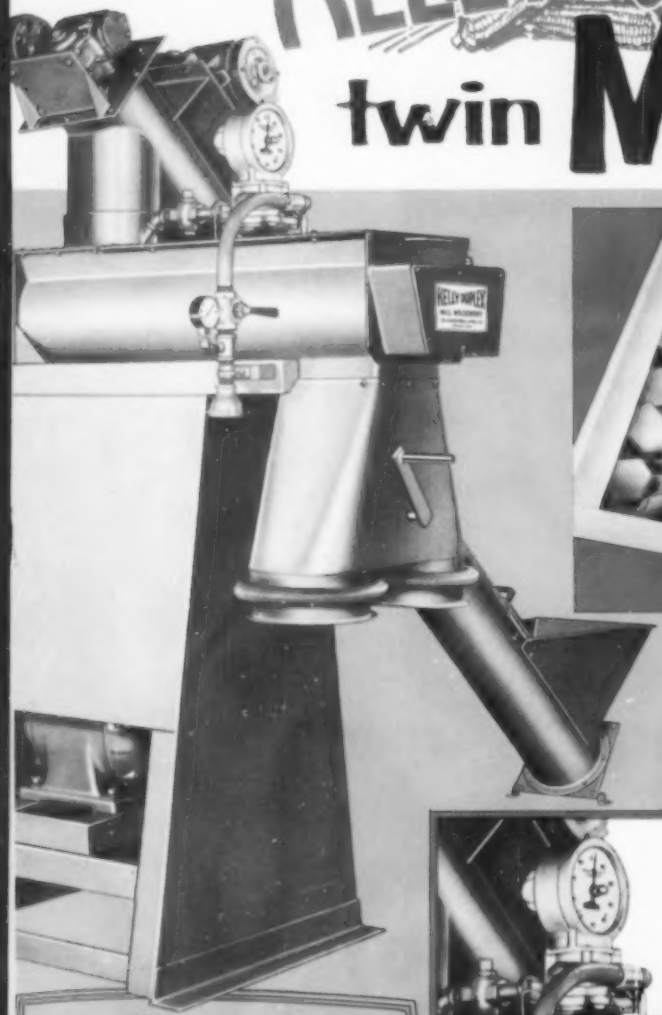
Mail this Card– No Obligation

KELLY DUPLEX

✓Check Here!

- ☐ Twin Molasses Mixer
- ☐ Vertical Feed Mixer
- ☐ Hammermill
- ☐ Vertical Screw Elevator
- ☐ Electric Truck Hoist
- ☐ Chain Drag
- ☐ Pit Auger
- ☐ Corn Sheller with Blowers
- ☐ Regular Corn Sheller
- ☐ Pitless Corn Sheller
- ☐ Gyrating Cleaner
- ☐ Corn Scalper
- ☐ Cob Crusher
- ☐ Corn Cutter and Grader
- ☐ Corn Crusher—Regulator
- ☐ Bucket Elevator
- ☐ Electric Bag Cleaner
- ☐ Forced Air Carloader
- ☐ Magnetic Separator
- ☐ Grain Feeder
- ☐ Grain Blower
- ☐ Complete Line Catalog

KELLY-DUPLEX twin Molasses Mixer



The mixing chamber, which consists of 2 rotary shafts and 36 individual paddles, is a model of blending efficiency.

Mixes quickly, evenly, thoroughly without balling or lumping . . . practically eliminates all cleaning!

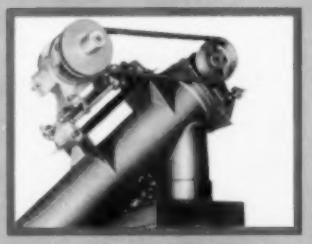
With a Kelly Duplex Twin Molasses Mixer in your mill, there's big volume and big profits ahead for you in either private brand or custom mixed sweet feeds. Features include a complete, easy-to-adjust control system that lets one man set and maintain the most exacting molasses-feed proportions with absolute accuracy . . . a twin paddle rotor unexcelled for fast, thorough, even mixing—and self-cleaning characteristics . . . a conveyor that swivels to any position or is completely demountable . . . and many, many others.

Before you buy, you owe it to yourself to compare this outstanding machine point for point (features, equipment, construction and cost) with all other makes . . . and see for yourself why a Kelly Duplex is your one best buy. The card will bring you full details.

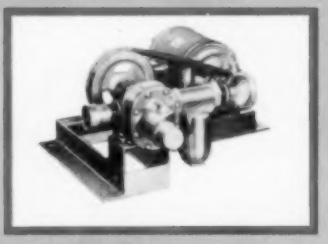
Make your own "point for point" comparison!

Mail card today for full details

Molasses Meter records in pounds, gives unexcelled accuracy, has turnback attachment. 3-way valve (at left) can be conveniently hooked up for retail bulk molasses sales.



Variable Speed Control on the 1 H.P. screw conveyor gives you positive, finger-tip control of feed flow into the mixer. Conveyor can be removed from mixer and used elsewhere, if so desired.



Molasses Pump is powered by 5 H.P. motor. Special strainer removes foreign matter before it can enter pump. Adjustable by-pass valve eliminates need for return pipe to molasses supply.

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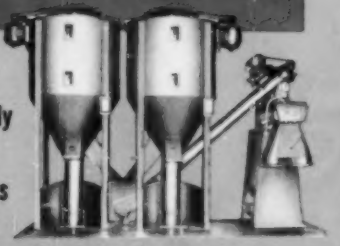

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Jan. 13-14 at Phoenix

Council Meeting To Map Cotton's Future Plans

■ **COMMITTEE HEADS will present reports on 1957 activities and recommendations. Sears, Roebuck chairman will speak.**

PLANS to meet the challenge of cotton's present situation with broader programs of activities will be mapped Jan. 13-14. These are the dates of the annual meeting of delegates of the National Cotton Council at Phoenix, Ariz.

Committee members will gather in Phoenix, where sessions will be held at the Hotel Westward Ho, several days earlier to draft their recommendations. These findings will be presented before the open sessions, starting Monday.

Theodore V. Houser, chairman of the board of Sears, Roebuck & Co., will be the principal speaker at the twentieth annual meeting of the Council.

Delegates and visitors will be welcomed Jan. 12 by Mayor Jack Williams of Phoenix.

An address by Council President George G. Chance, Bryan, Texas; report on the Council's expanded program finance plan by L. T. Barringer, Memphis, chairman, Finance Committee; and a discussion of the economic outlook by Dr. M. K. Horne, Memphis, the Council's chief economist, will complete the morning program.

Monday afternoon's program includes: "Reports of Industrywide Committee on Cotton's Research Needs and Opportunities," Dr. C. R. Sayre, Scott, Miss., chairman; "Report of Production and Marketing Committee," Cecil H. Collerette, Casa Grande, Ariz., chairman; "Quality Evaluation," J. D. Hays, Huntsville, Ala., vice-president, Production and Marketing Committee.

"Report of Utilization Research Committee," J. M. Cheatham, Griffin, Ga., chairman; "New Developments in Chemical Finishing," Sydney M. Cone, Jr., Greensboro, N.C., immediate past chairman of the board, National Association of Textile Finishers.

Recommendations of the Production and Marketing and Utilization Research Committees, and annual meetings of Council state units will conclude Monday's activities.

The report of the Sales Promotion Committee, W. B. Coberly, Jr., Los Angeles chairman, will open the morning session on the second day of the meeting. This will be followed by a discussion of the annual Cotton Fashion Award; a report of the Foreign Trade Committee, Hugo Dixon, Memphis, chairman; and a report by Everett R. Cook, Memphis, president, Cotton Council International, on "Cotton Market Development Abroad." An address by Theodore V. Houser, chairman of the Board, Sears, Roebuck and Co., will complete the morning session.

H. L. Wingate, Macon, Ga., chairman of the Committee on Education and Publicity, will preside during the report on Council public relations activities, which will open the Tuesday afternoon program. "How Radio Serves the Cotton Industry," a part of the public relations presentation, will be described by Jack Timmons, Shreveport, immediate past president, National Association of Television and Radio Farm Directors. Timmons is farm director of Radio Station KWKH.

Recommendations of the Sales Promotion and Foreign Trade Committees, general resolutions to be presented by Board Chairman Francis J. Beatty of Charlotte, N.C., and reports of the treasurer and of the nominating committee also are scheduled on the final afternoon. The new board will meet after adjournment of the general sessions.

The following committees have been named to meet at Phoenix:

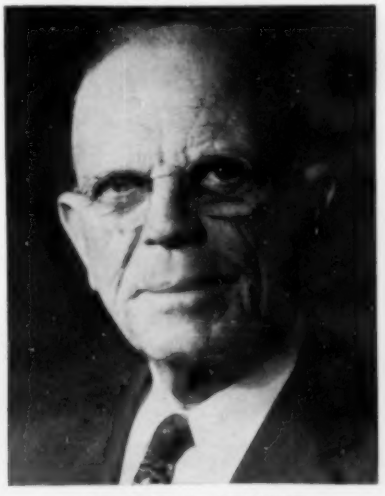
Production and Marketing—Cecil H. Collerette, Casa Grande, Ariz., chairman; J. D. Hays, Huntsville, Ala., vice-chairman; Harry S. Baker, Fresno, Calif.; N. C. Blackburn, Memphis; A. B. Emmert, Danville, Va.; A. W. Fisher, Kannapolis, N. C.; W. R. Flippin, Memphis; P. E. Harrill, Oklahoma City; J. H. Henry, Melrose, La.; Robert L. Horton, Paris, Texas; J. F. McLaurin, Bennettsville, S.C.; George M. Powell, Memphis; A. L. Story, Charleston, Mo.; and Adolph Weil, Jr., Montgomery, Ala.

Advisory Members: Eugene Butler, Dallas; W. O. Fortenberry, Lubbock, Texas; Otto Goedecke, Hallettsville, Texas; M. Earl Heard, Shawmut, Ala.; J. R. Kennedy, Bakersfield, Calif.; R. D. McCallum, Memphis; Ellison S. McKissick, Sr., Easley, S. C.; and J. Winston Neely, Hartsville, S.C.

Utilization Research—J. M. Cheatham, Griffin, Ga., chairman; Tom J. Hitch, Columbia, Tenn., vice-chairman; Alfred Bessell, Jr., Houston; Roy B. Davis, Lubbock, Texas; Eugene Hayes, Madera, Calif.; Otis Howe, Wabash, Ark.; J. L. Hurschler, Pasadena, Calif.; W. A. Joplin, Jr., Hayti, Mo.; E. H. Lawton, Hartsville, S.C.; C. W. Lewis, Deming, N.M.

W. Gordon McCabe, Greenville, S.C.; Roger Milliken, Spartanburg, S.C.; D. H. Morris, III, Geneva, Ala.; A. G. Paxton, Greenville, Miss.; Frank S. Pope, Villa Rica, Ga.; V. O. Roberson, Greenville, S.C.; Jess G. Stratton, Clinton, Okla.; C. R. Sayre, Scott, Miss.; Marshall O.

(Continued on Page 42)



GEORGE G. CHANCE

DR. C. R. SAYRE

W. B. COBERLY, JR.

THREE of the cotton leaders from different parts of the Belt who will take part in the program of the National Cotton Council meeting in Phoenix, Ariz., are shown here. George G. Chance, Bryan, Texas, producer and ginner, is Council president. Dr. C. R. Sayre, Scott, Miss., producer and research leader, will present the report of the Industrywide Communittee on Cotton's Research Needs and Opportunities. W. B. Coberly, Jr., Los Angeles crusher, will report for the Sales Promotion Committee, one of several committees to make recommendations.

as viewed from The "PRESS" Box

• More Seed Warnings

MANY WARNINGS regarding sale of cottonseed for planting are being issued by USDA and the states. Buyers and sellers this year should take every precaution to comply with all regulations and to make certain that seed quality is adequate. State and federal authorities, trade associations and others can provide reliable information on the matter.

L. F. Curl, USDA, Washington, has made the following statement on pink bollworm regulations:

"The regulatory officials of the states east of Texas and Oklahoma, and USDA earnestly request the full cooperation of the cottonseed industry, cotton farmers, and others in Texas, Oklahoma, and New Mexico, in preventing untreated and uncertified (for pink bollworm) cottonseed from moving into the other southern states because of the risk of moving live pink bollworms.

"Heavy movement of seed, from the pink bollworm regulated areas in Texas and New Mexico, and to a lesser extent from Oklahoma, are already under way. It is believed appropriate to point out to oil mills, gins, and others in Texas, Oklahoma, and New Mexico, that it is essential to comply with federal pink bollworm regulations governing movement of cottonseed into other states. Such seed must be treated under the supervision of the pink bollworm inspector to be eligible for certification."

Pink bollworm federal offices are located as follows: R. W. White, Box 2749, San Antonio, Texas (Phone: CA5-1692, Ext. 274), A. E. Frazier, Box 630, Capitol Hill Sta., Oklahoma City, Okla. (Phone: ME7-5818), G. E. Fulkerson, 723 Second St., N.W., Albuquerque, N.M. (Phone: 7-0311, Ext. 457).

• NCPA at New Address

MEMPHIS OFFICES of National Cottonseed Products Association are at a new address: 43 North Cleveland, Memphis 4. The postoffice address continues to be Box 5736.

• Bombings in News

BOMBINGS of Southland Cotton Oil Mills at Jackson, Miss., and Tallulah, La., in 1956 figured in recent Senatorial probes of labor rackets. L. M. Hoover of Jackson's Teamsters' Local refused to testify about the bombings, pleading the Fifth Amendment.

• Golfers Once Were Rare

GOLFERS are so plentiful at cotton industry conventions now that it's hard to realize that they were a rarity only 30 years ago. But, Thomas Ancrum, retired South Carolina oil mill manager, recalls his first experience with golf at a convention:

"I well remember the first time I took my golf clubs to a crushers' convention, at Wrightesville Beach, N.C., in 1925—and the jokes made by some of the other oil men. I would estimate that there were only six real oil mill men in the golf tourney in 1925, the others being brokers, chemists, salesmen and guests. The mill managers succumbed afterward—but it was too late; an honest score for most of them would show around 125, and the golf bug only helped them on the nineteenth hole in an elbow-bending session."

• Choosing Cotton Maid

COTTON'S MAID will be chosen soon after you read this. Finals of the 1958 Maid of Cotton Contest, in which 22 Cotton Belt beauties are participating, are being held Jan. 2-3 in Memphis.

• Laws Need Revision

FEED AND FERTILIZER LAWS need revision in Mississippi, Commissioner of Agriculture Si Corley recently said. Corley, who helped to write the present laws in 1928, said that changes have outdated the laws.

• Vertical Mulching

VERTICAL MULCHING is a new practice developed in Indiana and Illinois that may spread to the Cotton Belt. Organic matter is added to soil by blowing it into a trench behind a deep chisel. Equipment firms are active in providing implements.

Irrigation Short Course Set at Texas A & M

"What does the future hold for irrigation in the state of Texas?" This question and various answers to it will be the theme on which the annual Irrigation Short Course is opened at Texas A&M College, Jan. 16-17.

Other topics will include problems in cotton irrigation, irrigation problems generally, and management with irrigation, rounding out the two-day conference.

All sessions will be held in the Memorial Student Center on the campus, and are open to any person interested in irrigation.

Soybean, Grain Shippers Set Memphis Meeting

The Midsouth Soybean and Grain Shippers' Association will have a one-day midwinter meeting, Tuesday, Feb. 18, at the Hotel Peabody in Memphis.

The conference will begin at 10 a.m., according to Paul H. Hughes, secretary-treasurer.

James R. Coggeshall Dies

James R. Coggeshall, 50, businessman of Darlington, S.C., died Dec. 4, following a brief illness.

He was a partner in Coggeshall Brothers, a cotton ginning and fertilizer company, and a vice-president of the Citizen Bank of Darlington. He was a graduate of the University of South Carolina.

Drawing for Gin Exhibits Jan. 4

Space for exhibits at the 1958 Texas Cotton Ginners' Association convention will be assigned during a meeting on Saturday, Jan. 4, in Dallas. The meeting will start at 10 a.m. and will be held in the Dallas Room on the third floor of the First National Bank Building.

Edward H. Bush, president of the Gin Machinery and Supply Association, Inc., urges all firms planning exhibits to make their space reservations before or by Jan. 2, and to have a representative at the Jan. 4 meeting if possible.

Drawings will be held at the meeting for assignment of space and other business will be transacted by the Gin Machinery Association. Details of the exhibit plans and assignment of space are available from Bush and have been distributed to prospective exhibitors.

Producers' Transfers Gin Manager R. F. Gleason

Robert F. Gleason, manager of Producers' Cotton Oil Co. Gin at Helm, Calif., has been transferred to the new post of manager of the two Producers' Murietta gins, six miles west of Tranquillity. He will replace Earl Guenther, who is resigning to become a grower.

Gleason joined Producers' as a trainee in January of 1951, and became gin manager at Helm in July of the same year. Gleason has inaugurated several programs of his own in addition to his normal duties. He is well known throughout the valley as farm safety speaker, where he gives illustrated talks to schools, growers and luncheon clubs.

At Helm, Gleason hired college students as entomologists during the summer months. Growers contributed to a fund to pay Gleason's "college bug boys" who are recruited from the University of California at Davis, Fresno State College and Coalinga Junior College.

Succeeding Gleason at Producers' Helm Gin will be Jack C. King, 28-year-old gin manager trainee who has been promoted to gin manager. King worked for Producers' as a gin clerk in the Bakersfield area from 1949 to 1952. After four years in the U.S. Air Force, he was made a trainee at Caruthers before his transfer to Helm.

Mr. & Mrs. Earnest Duggins Observe Golden Wedding

Earnest S. Duggins, a retired cotton ginner, and Mrs. Duggins, celebrated their golden wedding anniversary in December.

The Duggins, who have lived in Fresno, Calif., since 1929, were married Dec. 1, 1907 in Collinsville, Texas. They were honored by their children and their spouses at an open house and reception in Fresno.

■ **S. L. KOPALD, vice-president of Humko, has been elected a vice-president of the Memphis Chamber of Commerce.**

After 100 Years

Mississippi Can Sell Cotton at Night

A Tunica County, Miss., man was freed recently by Gov. J. P. Coleman for violating a statute of the pre-Civil War era which prohibits the sale of "cotton in the seed" at night.

Jesse Woody of Tunica County, had been sentenced to six months in jail and fined $100 in December, 1956, under the ancient cotton law. He was charged with "buying cotton in the seed at night."

Governor Coleman in granting an indefinite suspension from the sentence said that "the defendant bought a very small quantity of cotton in violation of this ancient statute."

Under the old statute which has been carried forward with each succeeding revision of the laws "any person who shall buy, sell or exchange or receive or deliver, in pursuance of any contract of sale or exchange, any cotton in the seed or ginned and not bailed, between sunset of one day and sunrise on the next shall, upon conviction, be punished as for a misdemeanor."

The law prohibits buying of unginned cotton at night. It was enacted before the Civil War to prevent pickers from selling part of their pickings rather than turning it in to the owner.

■ **DR. CHARLES WILMOT has been appointed assistant agricultural economist in cotton marketing at the University of Arizona.**

Gibberellin Shows Much Promise

Gibberellin, the new plant growth stimulant made by Merck & Co., Inc., was a topic of much discussion at the Beltwide Cotton Production Conference which is reported in this issue. Dr. Jim Merritt, Merck scientist at the Conference, said many farmers in 1958 will use the chemical on part of their cotton.

Benefits cotton growers can expect include (1) Treating seeds for better stands of cotton resulting from increased and earlier emergence; (2) Spraying for increased boll set; and (3) Higher yield or longer fiber.

Several varieties in the West and Midsouth have responded favorably in 1957 research. The ability of these varieties to maintain growth produces a larger plant capable of setting more bolls and longer fiber.

Major cotton varieties on the Eastern Seaboard seem to respond similarly when weather is adverse. But under ideal growing conditions their determinate growth habit has limited their production of fiber and they apparently cannot be stimulated by spraying with gibberellins.

Extensive research on gibberellin will be continued by colleges, experiment stations, and industry. Dr. Merritt said the company is expanding its grant-in-aid program during 1958 along with research by its own scientists to increase the fund of knowledge in this field. Prime objectives in 1958 are: (1) Develop more exact timing and rates of application to improve fiber and yield; and (2) Establish large-scale field tests among growers so that the effects of gibberellin can be observed under practical conditions.

American Weed Society Sets Meeting Jan. 13-15

"Fundamental Research in Weed Control," will be the theme of the general session at the second meeting of the Weed Society of America, according to Dr. W. B. Ennis, Jr., Society president. The group will meet Jan. 13-15, at the Hotel Peabody in Memphis.

Hosts for the meeting will be the Southern Weed Conference, whose annual meeting will be held Jan. 16, following the Weed Society of America's meeting.

Other officers of the Society include Dr. A. S. Crafts, University of California, Davis, vice-president; W. C. Shaw, crops research division, ARS-USDA, Beltsville, Md., secretary, and Dr. W. C. Jacob, University of Illinois, Urbana, treasurer and business manager.

Commodity Groups Meet

National Commodity Conference has announced plans for its steering committee to meet with the House Agricultural Committee in January. The Conference will meet again in February. It held a meeting of 35 commodity groups Dec. 11-12 at Kansas City, during which the cotton program advocated by American Cotton Producer Associates and affiliated groups was presented.

LEADERS WHO PARTICIPATED in the opening session of the third annual Beltwide Cotton Production Conference, Dec. 12, at Memphis, are shown here. Left to right are Dr. H. Brooks James, Director of Resident Instruction, North Carolina State College, Raleigh; J. D. Hays, Huntsville, Ala., general chairman of the Conference and vice-president, Alabama Farm Bureau Federation; Dr. R. D. Lewis, Director, Texas Experiment Station, College Station; and Claude Welch, Director, Production and Marketing Division, National Cotton Council, Memphis, who read the paper for M. Earl Heard, Chairman of the Cotton Task Group and vice-president in Charge of Research, West Point Manufacturing Co., Shawmut, Ala.

Third Annual Conference Discussed Cotton Production Developments

National Cotton Council and cooperating agencies sponsored meeting of leaders in research, education and industry at Memphis Dec. 12-13 to review past progress and future needs.

LEADERS speaking at the 1957 Beltwide Cotton Production Conference emphasized the need for increasing the speed with which the cost of producing cotton is reduced while the quality of the bale that is produced is improved. The Conference met in the Peabody Hotel in Memphis on Dec. 12-13, with these general sessions preceded by many technical committee meetings.

Conference sponsors are the National Cotton Council and a large number of cooperating organizations. These include U.S. Department of Agriculture, land-grant colleges of the Cotton Belt, farm organizations, vocational agriculture teachers, the agricultural chemicals industry and others.

The following summaries of addresses during the Conference constitute the summary-procedings, published through the cooperation of the Council, which distributes them, and The Cotton Gin and Oil Mill Press:

Opening Statement

J. D. HAYS, General Chairman of Conference, and Vice-President, Alabama Farm Bureau Federation.

We are meeting here today and tomorrow for the primary purpose of taking an *up-to-the-minute look* at the progress and potentials in developing speedier ways and means of getting the cost of growing a bale of cotton *down* and the quality of that bale *up*.

Everyone connected with cotton production must surely realize the necessity of cotton becoming competitive in price and quality if our markets are to grow and make increased production permanent and feasible.

We must also surely realize our basic dependence on research and its practical application in achieving cost structures and quality gains that will enable us to become competitive while making reasonable profits. Now, we all know that a farmer's volume of production has a great deal to do with unit costs and profit. But unless our markets are expanded, how can we hope for increased acreage? And unless we have increased acreage, how can we get our costs in line to expand markets? The two go hand-in-hand; unless we have both, we are not likely to have either. Therefore, it seems obvious to me that research is our basic approach to meeting both conditions at the same time.

So, for added emphasis, let me again identify our main problem—one of finding speedier ways and means of getting cotton production costs *down* and quality *up*. In order to bring this word "speedier" into clearer focus, let's return to last year's Birmingham conference for just a moment. If my memory is correct,

I quoted some cost figures that economists worked up which showed that today's average cotton production costs across the Cotton Belt are something like $35 to $50 per bale lower than they would be if we were now using the same old-fashioned technologies of 10 years ago. Now, in some of our more efficient cotton producing areas, that figure might be even larger.

Although I would be the first to commend this program, and it does represent a tremendous job on the part of everyone concerned, let's think what it would mean to the cotton industry if we could have moved even faster—if our rate of progress had been doubled—so that today's production costs could be $35 to 50 per bale *less* than they actually are. Then we would really have something.

This additional amount equals or exceeds the government subsidy which paved the way for our annual exports to rocket from two million bales to the current average of something like six to seven million bales. On our domestic market, this amount roughly equals the price advantage of some of the competing fibers over cotton—a price advantage which has been helping steal looms and spindles away from cotton.

What cotton needs is some real rocket-age thinking and progress toward lower costs and better quality. We need to expand greatly our efforts toward speedier research accomplishments. Probing into the possibilities of greatly increasing the flow of research results from our research program is part of the task before us these next two days. Equally important is the matter of doing the best possible job of applying the research results available to us right now.

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Human Side Of Cotton Production

DR. H. BROOKS JAMES, Director of Resident Instruction, North Carolina State College, Raleigh.

The history of cotton production in the U.S. has been a part of the history of the economic development of the nation. During our early history, by far the largest part of our population was engaged in agriculture, largely in the production of our food and fiber supply. As time went on, ways of increasing efficiency in the production of food and fiber were developed. As a result, the proportion of the population required for this purpose decreased, and more and more people were enabled to transfer to other occupations and the production of other goods and services.

The average farmer now produces almost twice as much as he did 15 years ago, and only about 10 percent of our total labor force is engaged in farming. The remaining 90 percent of our labor force is engaged in producing the hundreds of items common to the American way of life. Although this process of a declining labor force in agriculture relative to the total labor force is essential to economic development and a higher level of living, it does bring with it real problems of adjustment and, in many cases, hardship to the families involved.

The development of new and more efficient techniques of production often means that some farmers need to get out of agriculture and find a place to produce other goods and services that society wants. The transfer out of agriculture may be quite difficult for many of these families. If it can be made successfully, however, the long term effect should be most beneficial to them, to agriculture, and to society.

Technological developments frequently favor one area or group of farmers at the expense of others. Farmers in some regions are able to take new developments and adapt them to their systems of farming and increase efficiency in production very rapidly.

Those in other areas, for one reason or another, are not able to take full advantage of new technological developments and soon find that a once profitable enterprise is no longer, or has become much less profitable. As a result, some areas will expand output of a particular commodity while other areas will decrease production. For example, North Carolina farmers devoted 1,985,000 acres of land to cotton production in 1926. In 1957, only about 347,000 acres of cotton were grown in this state. This is the smallest acreage grown in this state since 1866, which was the first year of record. In 1926 North Carolina produced 6.7 percent of the total U.S. cotton production; in 1957, only two percent. California, on the other hand, has experienced a phenomenal growth in cotton production only in the last few years.

Farmers may give up cotton production not only after it becomes an unprofitable enterprise, but they may give it up while it is still profitable provided the resources released from cotton production can be more profitably employed in the production of other commodities.

Many cotton farmers in the Southeast have been hard pressed economically for the past three decades. Many have shifted out of cotton production. Large numbers have left the farm altogether to find more profitable employment in industry. Many more are not in a position to take full advantage of the new technological developments in production that would enable them to compete effectively with other regions. Adjustments of the kind that force farmers out of production rather than pull them out can be quite painful, not only to the immediate families involved but to others in the area who depend on these farmers for their economic sustenance. We would like to keep this sort of adjustment to a minimum. But adjustment, however painful, is essential to the economic development of our country and the maintenance of a high level of living for our people. It is the economic hardship, of course, that has led us in many cases to interfere with the free market in an attempt to make the adjustment less painful.

Characteristics of the Cotton Economy

Cotton farmers are not a homogenous group. In fact, they are a very heterogenous group. A quick look at a few of their characteristics and those of the resources at their disposal will improve our understanding of modern cotton production.

• **Age of Operators** — Only about three percent of all operators of cotton farms are under 25 years of age; about 26 percent are in the age group 25-34 years; 26 percent, 35-44; 28 percent, 45-54; 18 percent, 55-64; and about 10 percent are 65 years or older. Although adjustments to new techniques and production possibilities are not limited to farms operated by any particular age group, the older operators tend to be somewhat less receptive to new ideas involving substantial changes in their operations.

• **Tenure** — In 1954, 59.3 percent of the cotton farmers in the U.S. were tenants; this compares with 28.8 percent tenants for all types of commercial farming in the U.S. The lowest percent tenancy for cotton farms (30.2 percent) is among those farms where the value of farm products sold annually is more than $25,000; the highest percent (66 percent) is found where the value of farm products sold is from $1,200-$2,499. The fact that approximately three-fifths of all cotton farmers are tenants has some effect upon the adoption of modern techniques of production, on cost of production, on production efficiency and on the kinds of policies which are required to increase efficiency in production.

• **Labor Force** — The labor force engaged in cotton production in the U.S. in 1954 amounted to 1,787,138. Of this number, 736,374 were classified as seasonal workers and 1,050,764 were classified as family workers, including operators. The total agricultural labor force in the U.S., as reported by the Census for 1954, amounted to approximately 9,500,000 people, including hired workers. A substantial portion of the total agricultural labor force in the U.S. is engaged in cotton production, at least to some extent.

The output per man-hour of labor employed in cotton production has increased about 100 percent in the U.S. in the last 15 years. This compares with an increase of about 91 percent during the same period for agriculture as a whole. Changes in mechanization, increased yields, and other technological improvements are responsible for the increase in the efficiency of labor.

• **Size of Farms** — In 1954, only about three percent of the 525,208 commercial cotton farms in the U.S. were producing as much or more than $25,000 worth of products for sale. These farms, however, cultivated 25 percent of the cotton acreage and harvested 39 percent of the cotton produced in this country that year. Another five percent of our cotton farms had a value of products for sale between $10,000 and $24,999 per farm. These farms cultivated 17 percent of our total cotton acreage and produced 15 percent of the bales harvested. These two groups combined, or only eight percent of our cotton farms, cultivated 42 percent of the total acreage harvested and produced 54 percent of our total production.

At the other end of the economic scale are the farms with a value of products grown for sale between $250 and $2,499. These farms comprise 61 percent of all cotton farms, but cultivate only 23 percent of our total acreage and produced only 18 percent of our total output.

The 31 percent of our cotton farms with a value of products produced for sale between $2,500 and $9,999, cultivated 35 percent of our cotton acreage and produced 28 percent of total volume.

• **Investment** — The average value of land and buildings per cotton farm in 1950 was $8,690; in 1954, $12,978, or an increase of 49 percent. The per acre value of land and buildings for cotton farms increased from $81.50 in 1950 to $111.31 in 1954, or 37 percent.

Total investment per worker on commercial cotton farms, in 1954, was about $9,800, ranging from about $4,700 in the eastern part of the Cotton Belt to about $32,000 in California. Generally speaking, investment per worker increases as total production of the farm increases in all parts of the Belt.

• **Conveniences and Facilities**—The percent of cotton farms that had selected conveniences and facilities in 1954 are as follows:

	1950	1954
Telephones	7.6	13.5
Electricity	62.9	86.8
Television	—	18.2
Piped running water	—	30.2
Home freezers	4.9	16.3
Motor trucks	23.6	37.6
Automobiles	38.4	46.6
Tractors (all types)	31.0	41.9
Tractors (except garden)	30.8	41.6

• **Nonfarm Work** — The number of cotton farmers working off the farm 100 days or more increased 27 percent from 1950 to 1954. In 1954, 33 percent of all cotton farmers worked off the farm to some extent.

• **Use of New Technology** — I suppose that it is relatively easy for the technician to get into the habit of explaining new production practices and then assuming that all cotton farmers can adopt these and thereby increase their income and level of living. The process is not this simple. There is a tremendous variation in cotton farms. Three things are important if cotton farmers are to make full use of new techniques of production.

First, most new techniques of production increase the capital requirements for cotton production. In 1954, only about two cotton farms out of every five had a tractor. Imagine what a problem you would have in trying to produce cotton by using the latest recommendations without a tractor to work with. The possibility of transforming the newer recommendations into higher income and a higher level of living on a small farm with very little capital and with little or no provision for increasing the amount of capital available to the farmer is indeed very small. Modern cotton production on an efficient basis calls for large amounts of capital. Without this added capital, much of our efficiency-creating new technology cannot be put to use.

Second, modern techniques of production require a large volume of business to be efficient. Many of our newer efficiency-creating practices require large amounts of capital. These large amounts of capital cannot be justified unless they promote a large volume of business. At least 60 percent of our cotton farmers do not have sufficient volume to justify the capital needed for efficient production. For example, a cotton mechanization study in North Carolina indicates that, on the average, a farmer must harvest about 100 bales of cotton annually with a mechanical picker before this becomes a more efficient method of harvesting than hand picking. Three-fourths (76.96 percent) of the cotton allotments in North Carolina were six acres or less in size in 1955. This means that very few North Carolina farmers can afford a cotton picker for their own use alone. It also indicates the difficulty of getting many other production practices adopted.

Third, the cotton farmer must learn new techniques of production if he is to take full advantage of new technological developments. This creates no real problem on the larger farms where cotton is of major importance and where competent management is available. On the other hand, it does create very real problems on at least 60 percent of our cotton farms where the volume of production is very small, where the capital involved is very limited, and where there is not sufficient cotton produced to justify spending much time and effort on it. This latter group is not likely to adopt production practices readily; neither are they likely to sit down and learn all that they need to know in order to produce cotton efficiently.

I have given you a few of the reasons why cotton farmers do not readily adopt new techniques of production and transform them into higher levels of living. There are many more. For example, many small farmers may adopt one practice and may not see much benefit from this practice simply because they did not adopt the other practices which should have gone along with it.

• **Policy Implications** — The efficient production of cotton requires large amounts of capital, a large volume of business, and a high level of management. The pertinent question is: Do our policies and programs promote orderly development of these three elements of efficient cotton production? Do we have a credit policy, for example, designed to take care of the large scale efficient producer, or was it developed primarily for the small inefficient producer? Is our cotton price support and control program designed to increase efficiency in cotton production or does it have some other objectives in mind? The cotton industry has many of the characteristics of a declining industry. This is true at a time when the industry needs enlarging if it is to take advantage of all of those things that are cost reducing and produce a product at a price that can compete in terms of both price and quality not only with other fibers here in the U.S. but with cotton and other fibers throughout the world.

For the past 25 years, our policies have been aimed at taking care of the small cotton farmer. I believe the time has come when we should develop two cotton programs. One that would promote a freer allocation of resources, efficient cotton production, and permit cotton to compete with other fibers and with cotton from other countries in a world market. A second program would be designed to take care of the small cotton farmers. The latter program should not depend upon the pricing mechanism to accomplish its objectives. It is my firm belief that unless something is done in this regard within the next few years, cotton will continue to behave as a declining industry.

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Cotton Task Group's Findings and Recommendations

M. EARL HEARD, Vice-President, West Point Manufacturing Co., Shawmut, Ala.

The Eighty-Fourth Congress provided for the establishment of a five-man, Bipartisan Commission—to be appointed by the President—and charged with developing recommendations for bringing about the greatest practicable increase in the industrial use of agricultural products.

In transmitting its report to the Senate last June 15, the Commission concluded its assignment. The report was published as Senate Document No. 45. The Commission delegated the collection of the details of its study to some 18 task groups.

The over-riding purpose of this whole effort in behalf of American agriculture can be summed up in the following language which I quote from the Commission's own report:

> "Can the economy develop profitable industrial markets capable of absorbing enough of the excess farm production to minimize, possibly even to eliminate, the need for costly restrictions, supports, and surplus-disposing operations?"

The answer, one in which our Task Group heartily concurred, is:

> "The Commission believes the answer is an emphatic "yes," provided the necessary steps are taken to make possible and encourage such a development."

The Commission went on to outline what it meant by "necessary steps," and listed several needs. Two of these needs seem specially pertinent to cotton:

First: A sufficiently sharp sense—lacking so far—of the importance, the possibilities, and the urgency of increased industrial utilization approach to farm surplus problems, and

Second: A greatly expanded program of research involving all the scientific disciplines relating to the production, distribution, and utilization of farm products.

• **Cotton Group's Study** — Our Cotton Task Group began its study from a point of view that cotton has been a prominent textile fiber for a very long time. Since the beginning of the Industrial Revolution a couple of centuries ago, cotton people have constantly sought to broaden their markets, and most of the opportunities for really new uses have already been pretty fully exploited. While we did suggest some possibilities for new uses, our group was a lot more impressed with possibilities for increasing consumption of cotton through improving its position in traditional uses.

The Task Group was decidedly optomistic about the export possibilities. Fiber consumption, on a per capita basis, is extremely low throughout most of the world—but it has been rising and seems likely to continue rising! While the tendency toward national self-sufficiency abroad is a factor to be recognized, it isn't necessarily as important a restraint on international trade in cotton as it is in the case of foodstuffs.

There are a lot of interesting points around this export market potential, and strengthening our export market seemed to us to rest on several possibilities which are common to the opportunities for increasing cotton consumption here at home.

And where are these opportunities for increasing the consumption of cotton? Generally speaking they seem to fall in three categories.

First are opportunities to increase the size of the total textile market. Other industries—notably the producers of autos and assorted luxury goods—have been taking a progressively larger share

of the consumer's dollar for a good many years. They've done it by developing improved and different products, and by vigorous promotion. There is no basic reason why textiles should not be able to employ the same techniques for enlarging markets.

A *second* group of opportunities for increasing cotton consumption lies in the area of increasing our share of end-use markets which are already partially supplied by cotton—in apparel uses, other fibers are going into end uses already partially supplied by cotton, in quantities equivalent to 2,600,000 bales of cotton—in household uses, the figure is almost 1,900,000 cotton bale equivalents—in industrial uses, the figure is 8,600,000 cotton bale equivalents. A total of other fibers equal to better than 13 million bales of cotton goes into end uses where cotton is already being used!

The *third* category is the matter of new uses. There are some fiber products in which practically no cotton is now used, and which might be looked upon as new uses. These include apparel lining, cotton bale covering, furniture upholstery filling, automobile seat covering, cigarette filters, thermal insulation, and rag content paper. The size of the present market for these products totals the equivalent of about 2,400,000 bales of cotton.

Whether the objective be to increase total demand for textiles, or to increase cotton's proportionate share of the market—the basic factors that must be worked on are *price, quality, and promotion.*

On this matter of price, of course, the only real hope for getting on a strong competitive basis lies through reducing costs. But if farmers' costs, and the costs of services between the farm and the mill, can be reduced so that cotton can be made available at a lower price, this obviously represents an important way of pushing back one of the large barriers that stands between our industry and the possibility of winning larger markets in this country and abroad.

Likewise, if cotton's present desirable qualities can be further improved, or if properties not now possessed to a major degree can be imparted to it, cotton's utility value will be increased—and in this way its consumption potential will be increased.

One of the cardinal principles of successful promotion is to promote a product that's equal to the competition in terms of both price and quality. Hence, if we can lower costs and improve quality, we can confidently expect promotional effects to be more effective in winning larger markets for cotton.

I have seen the estimate that more than three-fourths of the price a mill has to pay for a bale of cotton is accounted for by farm production expenses. Could there be any larger challenge to a group whose professional interests lie in improving cotton production technology?

Our Task Group was deeply impressed with the need for, and the opportunities for, broadening and enlarging cotton's markets through quality improvment. When we think of playing up to consumer preferences, we logically think a lot about things that need to be done to fabrics. But have we really paid much attention to the possibilities of changing raw cotton in such a way as to make it more receptive to finishes and the like after it becomes a fabric?

In our report to the Commission we had a great deal to say about the opportunities which seemed particularly promising in the field of production, and in raw cotton marketing as well. We estimated that if such opportunities could be fully exploited, the equivalent of 30 to 50 percent reduction in the effective price of cotton to processors might be accomplished while at the same time, the income position of growers would be improved.

• **Recommendations On Research** — The Cotton Task Group, in making its recommendations to the Commission as to ways of bringing about the greatest practicable increase in the industrial use of cotton, placed great emphasis on research. Of the 20 recommendations which we made, all but four of them had to do with strengthening the federal government research program for cotton—and with measures which, in our view, would help bring about that "sufficiently sharp sense of the importance, possibilities, and urgency" of this approach to increasing the consumption of cotton.

M. EARL HEARD
Chairman,
Cotton Task Group

We recommended some changes in the over-all administration of the USDA which we felt would help insure that aggressive research was made an effective part of our farm policies relating to cotton.

We recommended an immediate reversal of the trend in USDA's total research program, which seems to be assigning cotton a decreasing share of that total.

We recommended a substantial strengthening of Extension and similar work, in order that research results might be more quickly and effectively brought to a commercial application.

We recommended some measures which we felt would help attract and hold an increasing number of able scientists in the USDA's research work.

We recommended a more realistic level of financing for cotton research. On this point, we all recognize that there can be no hard and fast rules as to how much should be spent on research. But when we looked at the enormous expenditures involved in rather futile efforts to solve the surplus problem in agriculture,—when we looked at the staggering amounts of money the federal government is putting into research in other parts of our National economy—and when we looked at the class of research competition cotton is up against from other fibers—we decided that a level equal to three percent of the farm value of cotton lint represented a reasonable level of federal expenditure on cotton research. On the basis of recent crops, a cotton research budget in line with this recommendation would amount to about $72 million annually, in contrast with the current budget of around $17 million.

As to a suitable apportionment of a $72 million fund across the many scientific fields which cotton embraces, our Task Group was reluctant to make a hard and fast recommendation. We did offer some general guides, but with the emphatic suggestion that any apportionment would need to be flexible and capable of responding to changes in the economic situation, actual research accomplishment, the development of promising new leads, and the like. Briefly, our rough guides contemplated about this sort of break-down:

For development and commercialization of principles, techniques, equipment and the like, about $12 million annually. Industry has found the costs of exploiting the results of its research can be awfully expensive. Other than the federal Extension Service, the present USDA research program has no provision for this follow-through.

On the balance of the $72 million, we recommended that, as a starter, it be about equally apportioned between the cotton production and marketing fields on the one hand, and utilization and product market research on the other—in other words, about $30 million in each of these broad areas of research.

The Cotton Task Group has been discharged and the Bipartisan Commission has completed its assignment. The whole effort began as a result of a desire on the part of the Congress to find a more sound basis for our federal agricultural programs. A terrific amount of time and effort went into studying the plausibility of this approach to solving the surplus problem, and in all good faith a favorable report has been returned to the Congress . . . a report which makes very clear that the over-riding need is *the desire* and *the funds* for a reasonably adequate program of research and development. ◆ ◆

Cotton Production

Research—Education Needs and Opportunities

DR. R. D. LEWIS, Director, Texas Agricultural Experiment Station, College Station.

Most, if not all, of us are here today because of our faith in research, education and intelligent applications of the findings of research to the great agricultural industries of this country.

Let us review a few of the great forward strides in farming the past few years:

1. Since 1910 the farmers of the U.S. have doubled their total output; tripled their output per man hour; and are now

operating their farms and ranches with a third lass manpower.

2. Since 1940 the output per farm worker has increased by 83 percent—as contrasted with an average increase of only 38 percent in other industries.

3. These increased outputs are the direct results of the ingenuous ability of the U.S. farmer to adopt and use research through education effectively.

4. Because of these tremendous technological advances in agriculture, nearly 90 percent of the nation's labor force now make their living in off-the-farm industries, some of which are still agriculture.

5. In no other country on earth do consumers have more money left for purchasing non-farm products, after they have satisfied their wants for foods and fibers.

These advances are primarily tributes to and the result of the application of research in the broad and varied phases of production of agricultural commodities in this country. Yet, comparatively few people in this nation understand and appreciate the values and significance to them of the high production efficiency of American agriculture.

Frankly, many of our research and extension efforts have been and are now being questioned as to emphasis or essentiality. This is especially true of so-called production research in agriculture. Large and influential groups, individuals and the press tend unwittingly to hold research and extension responsible for the current surpluses (for instance—$2,300,000,000 of public funds tied up in wheat on June 30—$13.40 for each person in the U.S.). *They do not recognize that possibly the operation of inadequate public policies may be a chief factor.*

• **Concepts of Modern Agriculture** — Our first big need and opportunity in relation to research and education in agriculture is to develop and present effectively, among those of us engaged in each of these three segments of agriculture and with the general public and our elected representatives, adequate concepts of modern and future agriculture. As Roy Battles of the National Grange said to Experiment Station directors recently, "Our city friends do not understand us." They do not understand the basic problems of agriculture, nor our functions and services in research and education and their stakes (steaks, too) in them.

First, let us do away with the careless use of such phrases as "agriculture and industry." Agriculture, in its broad phases, is the major industry of this country.

In 1955 Board Chairman T. V. Houser of Sears, Roebuck & Co. stated— "The agricultural world and industrial world are not two separate economies having merely a buyer-seller relationship. Rather, they are so intertwined and inseparably bound together that one must think of them jointly if there is to be any sound thinking about either one or the other."

• **Agribusiness** — Leaders in our land-grant institutions and in farm organizations have been too modest in pointing out the modern concept of agriculture-business interrelations and in accepting and acting upon the accompanying challenges and opportunities. Probably the most complete analysis of this interrelation is to be found in the study sponsored by the Advisory Committee to the Program in Agriculture and Business of the Graduate School of Business Administration, Harvard University.

Agribusiness as defined by Davis in the Harvard study is "the sum total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing, and distribution of farm commodities and items made from them." Essentially, the term involves the functions which the term "agriculture" denoted 150 years ago.

The agricultural and business units in this "total agriculture" are grouped by Davis into three aggregates: farm supplies, farming and processing. This group comprises about 30 to 50 percent of the total volume of national transactions. About 37 percent of the total national labor force is engaged in these three aggregates. Within this group, at least two persons are employed elsewhere for each one on the farm.

Obviously, recognition of the modern and future natures of agriculture through such concepts as "agribusiness" will lead to a continuing process of evaluation and orientation of the research and education. The responsibility of our public institutions is to the total of agriculture, not to limited concepts of farming and ranching. Futhermore, research in agriculture benefits not only all the segments of agriculture, but the ultimate consumers of the products of farm and ranch.

The needs, opportunities and the responsibilities for research and education are tremendous under the total agricultural concept. The opportunity to serve and to build goodwill among citizens in general is limited only by our vision of these interrelationships.

• **The Future of Agriculture** — What can you and I do about research and education for the future agriculture? One definite procedure is that we shall each engage in "pin-pointing" the likely problems of the future so that our research may be, so far as possible, directed toward accumulation of knowledge, development of principles, and the creation of new ideas and materials.

Secondly, we can each take a part in placing and keeping clearly before the public in general, "The very real values of research, extension and technical assistance to improvement of efficiency, lowering the costs of production, and improving qualities of the products which ultimately reach the consumers, with or without processing enroute."

With all the vision and vigor at our command, let's take the offense for production research and education—never sell them short! To be sure, production research has made surpluses possible; but production research is not responsible for these surpluses—by itself it does not decide the kind or extent of use of acres or of materials, nor does it set the economic framework and public policies within which agriculture operates.

And so I close as I began—with a statement of faith:

1. That the great cooperative systems of federal, state and industrial research and education in agriculture and related industries are one of this nation's greatest resources.

2. That the dynamic stability and prosperity of agriculture depend on how we further develop and use this resource.

3. That we must be continually prepared for emergencies and new hazards.

4. That there is a growing realization of the need for the discovery and synthesis of new fundamental principles in the sciences basic to all phases of agriculture.

5. That research can lend us to better understandings of the increasingly complex chemical, physical, biological, mechanical, atomic, economic and social problems in agriculture, present and future.

6. That today's research and education is tomorrow's progress.

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Cotton Improvement

New Genetic And Breeding Techniques

DR. CHARLES F. LEWIS, Agronomist, USDA-Texas Experiment Station, College Station.

My purpose is to focus attention on what possible contributions the breeders, the men who develop seeds to plants, can make to improve cotton.

First, consider the types of plant materials that the breeder has at his disposal: (1) There are the commercial varieties which are the best cottons that are available today. No one thinks that these varieties are perfect and selections and crosses among the commercials are probably the most widely used source of material for the breeder. (2) Varieties developed in foreign countries are brought into the U.S. and they add to our stock of materials. (3) A collection of obsolete varieties is maintained at Mississippi Experiment Station. Although these varieties are not popular today, they do contain certain properties which are desirable. (4) At the Texas Experiment Station there is a collection of primitive cottons from southern Mexico and Guatemala. All varieties trace back to this center of origin where cotton was found after Columbus discovered America. (5) There is also a collection of the plants closely related to cotton, the species of Gossypium. Except for the Asiatic cultivated cottons and the long staple American-Egyptian types, these plants are wild shrubs found among the native vegetation in many parts of the world. These wild cottons are all cottons to the botanist, but the differences between the species are great.

Thus, the breeder has at his disposal the modern domestic commercial varieties, foreign varieties, obsolete varieties, primitive cottons, and the relatives of cotton. From this store of material, he can choose whatever he wishes, employ the breeding method he judges to be most appropriate and set out to remedy the weaknesses he sees in cotton.

• **Research With Hybrids** — There are several locations, where work is being done with hybrids between the species. An important part of our work in Texas has been in the investigation of the possibility of using species hybrids in cotton improvement. In this type of work, it was necessary to do basic research and answer such questions as (1) which species can be crossed, (2) how can sterile hybrids be made fertile, and (3)

which hybrids would apt to be successful in Upland improvement. This is good basic science, and people get engrossed in the technical endeavors of cytology and genetics. This work has been going on for about 15 years, and it is appropriate to appraise this type of material in terms of practical improvements that would benefit the cotton trade.

Several different combinations of species are available, but most of the work has been done with a hybrid combining a cultivated cotton of Asia, a wild shrub from Arizona, and American Upland cotton. The progeny of this species hybrid has a wide range of variability in nearly all plant and lint properties.

There are cotton plants such as you have never seen before, but they are invariably inferior. On the other hand, they often have one or more properties which would be most desirable to have in a commercial variety. A common situation is to have a vigorous plant with small bolls, low lint percentage, and low production, but the plant may be resistant to a disease and have a particularly good fiber quality. The trick is to separate what you want from what you don't want—to untangle the good from the bad.

When the pedigree system of selfing and selection is practiced on the original hybrid with no backcrossing to Upland types, odd and interesting things can be developed but they are inferior to commercial cottons in one or more respects.

When an orthodox backcross system to Upland is employed, there is a too rapid return to the Upland type. The feature of the hybrid which may be desirable is diluted and lost.

Most strains have been developed by a modified system of backcrossing and selection where backcrossing is followed by one or more generations of selfing and selection before another backcross is made. A series of strains has been developed by this system ranging from the high-yielding Brazos variety to the high-strength Able line. The strength of 22's carded yarn increases from about 115 to 160 in this series. Increasing strength and yarn quality is accompanied by decreasing yield. An increase in yarn strength of 10 percent is associated with about 10 percent reduction in yield.

The bulk cross, or recurrent selection system of breeding has, so far, resulted in similar outturns to the backcross and selection system. Strains with the desired quality are about 10 percent below Upland standards in yield.

Re-selections from some of the older strains derived from the species hybrid appear most promising. There is a possibility that an improvement in quality can be made with no sacrifice in yield.

Probably the greatest opportunity in species hybrid material is in quality improvement. The question is how much natural variation occurs in each of these properties—length, strength and fineness?

A three-species hybrid has about the following range of varation in length, strength and fineness.

Length, U.H.M., Inches 0.78-1.25
Fineness, Micronaire 2.0-7.1
Strength, (1,000 p.s.i.) 71-148

Taking all cottons into consideration, the range would be even greater. Of course, there are properties of cotton, such as cell wall thickness, perimeter, elasticity, and maturity, which are only indirectly measured by these three things. Yet these three are, at the moment, the most commonly measured properties.

• **Which Combinations Are Best?** — If the extent of the natural varation sets the limits within which cotton breeders can operate, then the question is which combinations of fiber properties would be most desirable? In cotton we are dealing with a natural fiber, formed by a biological process, governed by the laws of living things, and the properties cannot be manipulated at will as may be possible with manufactured things.

Cotton is a versatile fiber, and many different things can be made from cottons with properties falling within the Upland type. This is the general-purpose fiber from which many end-products can be made. But we ought not to assume that quality in a general-purpose cotton cannot be improved. Our spinning tests have shown, for example, that a cotton with about 1 1/32 inch staple, 4.5 Micronaire and 100,000 p.s.i. gives an improved yarn count for 22's carded yarn (140 vs 115). We have such fiber properties in experimental strains, but they must be made to yield as well as our present commercials or they will remain experimental strains. Right now the best we can offer with such a fiber has about 85 to 90 percent of the yield of the best commercial. The good from the bad has not been completely separated. Low lint percent and late maturity are the most troublesome features to overcome.

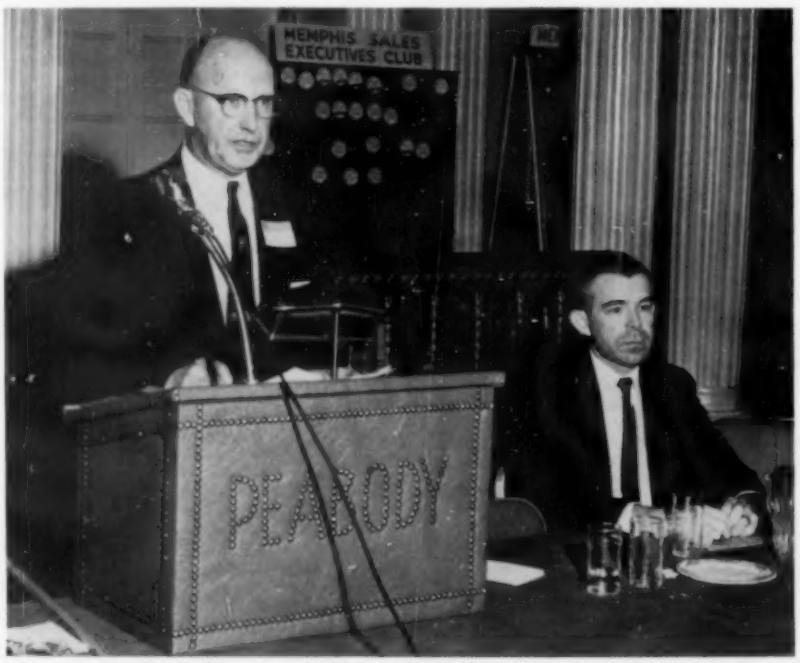
• **Other Cottons** — If cottons outside the area of the Uplands are considered, special cottons for particular end-uses are found. The Asiatics and the American-Egyptian have specialized markets. The man-made fibers have had some success, I understand, at tailoring a specific fiber for particular end-uses and taking that market away from competing products. Could cotton ever hope to play this game? It might, within the limits set by nature.

One thing we are trying to do at College Station is to develop several experimental strains of cotton with different fiber specifications. Our hope is that these experimental strains with different fiber properties would serve as material for spinning trials and manufacturing performance tests. This would add some to the volumes of information that already exist on cotton quality. A series of lines has been developed with increasing tensile strength with cottons ranging from 75,000 p.s.i. to around 130,000 p.s.i. How much strength would be desirable? We think that maximum strength is not optimum strength. Perhaps 100,000 p.s.i. is plenty for most purposes.

Another objective is to develop a relatively long, coarse cotton similar to Tanguis but in an Upland type plant; also, to establish a strain with coarse fiber and length just under an inch. The other objectives are to increase length and strength, holding Micronaire in the average range. These strains will not be up to commercial standards in all respects but they will help breeders decide on objectives for quality improvement and might serve as a starting point for a program to combine quality with all the other desirable features a successful variety must have.

• **Summary** — In summary: Cotton breeders can collect a wide range of materials from commercial sources and public agencies which maintain the regional collections.

Attention must always be paid to good agronomy—yield, boll size, lint percentage, earliness, disease resistance and



THE SECOND SESSION heard discussions on the use of new genetic and breeding techniques as tools for cotton improvement and cotton improvement through basic physiological research. Speakers were Dr. Marion W. Parker, Director, Crops Research Division, ARS-USDA, Beltsville, Md., (left) and Dr. Charles F. Lewis, Agronomist, Texas Experiment Station, College Station.

boll type, but increasing emphasis is being placed on fiber quality.

Considering all cottons, a wide range of variation in fiber properties exists. This presents the opportunity to improve the quality of a general purpose cotton and to explore the possibility of developing cottons with fiber specifications for specific end-uses.

Species hybrids have not been fully explored as sources of material for cotton improvement; most work has been concentrated on one hybrid. There is no doubt that they contain factors for disease resistance, vigorous growth, possibly drouth resistance and a wide range of fiber properties. With several people working on this problem, better know-how on the handling of this material will lead to some practical improvements of benefit to the cotton industry.

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Cotton Improvement

Basic Physiological Research

DR. MARION W. PARKER, Director, Crops Research Division, ARS-USDA, Beltsville, Md.

Today, American cotton growers can produce a bale of cotton with half the land and one-third the labor required 30 years ago. This accomplishment results from improved varieties, better cultural practices, improved disease, insect, and weed control, and mechanized operations all the way from delinting seed and planting through harvesting.

But if we look behind these improvements—trace them back to their origin—we will find that in every case someone, somewhere, made one or more fundamental discoveries upon which the improved practice has been based. Such discoveries are what we call basic research.

In the beginning, when every step is a big step forward, a small amount of fundamental knowledge can lead to many advances through applied research. But after a time, the easy questions are all answered. The going gets rougher. And it becomes necessary to replenish the stock of fundamental information in order to make further progress.

This has been pretty much the story of research with cotton. For example, the fundamental research done years ago on the development and structure of the cotton fiber laid the groundwork for the more recent applied research that has given us the many instruments in use today for measuring strength, length, fineness, and other fiber properties.

Sometimes, certain advances in applied research have come first, and we've had to backtrack into basic studies in order to continue to get ahead. For example, when significant advances were made in mechanical harvesting of cotton, the need for chemical defoliation became apparent. We tried everything on the shelf to find the most effective defoliants. It was strictly a cut-and-try procedure. And we weren't getting very far. Then we backed up and began basic studies of the cotton plant along with the chemicals, to find out why and how some chemicals caused the cotton cells to grow, die, or develop in some special manner.

In this search, we went back to early basic research that had been done with growth-regulating compounds and their effects on various plants. For example, studies with Coleus had shown that debladed leaves, which ordinarily drop from the plant, remained attached when the tips were treated with indoleacetic acid. Other workers treated flowers of plants with chemicals and found that in some cases the fruits stayed on and developed without pollination. In other cases, fruits or other plant parts fell off. Later studies further demonstrated that chemical substances can be used both to accelerate and to inhibit abscission of leaves and fruits of many kinds of plants.

Utilizing this background of fundamental information in work on cotton, we went on to find that successful defoliants are those that cause a particular type of reaction in the cell physiology of the cotton plant. This means, in primary screening work, that we can now go directly to those chemicals that are most likely to give this type of reaction. We also have a better basis for postulating entirely new chemical compounds that seem likely to do similar things to the cotton plant.

Furthermore, the basic research on plant-growth regulators has provided the background for the applied research through which we are developing many other uses for chemicals in agriculture. Basic research has been responsible for the development not only of defoliants but also of chemicals to thin fruit blossoms, to keep fruit on trees until picked, to root cuttings, to prevent sprouting of potatoes, to kill weeds, and for certain other purposes where the regulation of growth is the thing needed to do the job. The recent development of antibiotics to control plant diseases really goes back to the early work which showed that some chemicals move through the plant.

• **Basic Research Precedes Progress** — I could mention any phase of cotton production—or any other crop, for that matter—and we would find that a certain amount of basic research has preceded whatever progress we've made. And we've come quite a distance by this route. But we still have a long way to go—if we are to further increase production efficiency and develop those fiber qualities that will give cotton maximum advantages in today's highly competitive market. Also we must keep in mind that at the same time research is being made in competitive fields. We will have to keep pace if we are to hold our own in cotton research.

Unfortunately, our storehouse of fundamental knowledge is fast being depleted. We're finding it more and more difficult to get the answers to our cotton problems through applied research. Much too often, we're running into blank walls in one or more aspects of almost every problem in our efforts to develop new varieties with built-in disease resistance, tolerance to extremes of temperature and moisture, and specific qualities to meet specific market demands.

Over the years, most of our research on cotton has been directed to specific problems. The problems were important, and it was necessary that we find the answer as soon as possible, just as it's necessary to drop whatever we're doing to put out a fire once it gets started. But how much better it would be if we had learned how to prevent the fire in the first place. It's the same with research. Because of the invasion of a destructive disease, we have often had to divert our scientists and facilities from longtime fundamental studies to the applied research job of breeding a new resistant variety. This kind of a "fire run job" may not make any progress except to save disaster in an infested area. It's difficult to make real advances in this on-and-off approach to basic research.

These lapses have occurred across the board in crops research. And they're one reason we're now so dangerously low in basic knowledge, upon which our applied research depends for continued progress.

• **Pioneering Laboratories** — Taking account of this situation, in the recent realignment of functions in the Agricultural Research Service, provision was made for the establishment of pioneering research laboratories. The scientists working in these laboratories will be concerned not so much with the new application of old information to immediate problems, but rather with broadening and deepening men's understanding of the physical world and of life processes. We are confident that these laboratories will encourage the freer play of genius in agricultural research, and that the new scientific facts and principles discovered will make all our applied research more efficient and effective.

So far, two of these laboratories are in operation. The Pioneering Laboratory for Mineral Nutrition is currently studying the effects of mineral nutrition on the metabolism of plants, and the Pioneering Laboratory for Plant Physiology is studying the effect of light on plant growth annd metabolism. Charters have been approved for three other laboratories for pioneering research on blood antigens, on insect pathology, and on insect physiology.

We in crops research are most interested, of course, in the Laboratory for Plant Physiology. We're planning two other laboratories for pioneering research on plants. One will be on plant pathology in the area of virology, and the other on basic genetics in the area of physiological genetics.

I want to stress that the information gained in each of these pioneering research laboratories in plant science will benefit all crops research. These groups are working under an open-end charter, with the goal of advancing agricultural science generally—thus giving us the foundation for solving particular agricultural research problems. For example, the fundamental research in the area of virology will not be concerned with cotton per se. But if cotton comes up with a serious virus disease, we will go to the pioneering laboratory for the fundamental knowledge needed to guide us in developing methods of combating the disease. The same holds true for a virus disease in any other crop.

Similarly, we are hopeful that the pioneering laboratory studying physiological genetics will analyze single gene effects and gene interactions—to provide fundamental information needed by those attacking such problems as the physiological basis of improved characteristics in crop plants, including cotton.

Obviously, the success of this pioneering research program will depend on the scientific caliber of those chosen as lead-

ers of the laboratories. Each leader must be a man of recognized eminence in basic research achievement, who is dedicated and capable of continuing basic research productivity. He must be able to enter an unexplored sea of agricultural phenomena, with an allotment of funds for a boat, a few capable co-workers as oarsmen, and expect to make discoveries that will contribute materially to agricultural welfare.

• **Basic Physiological Research** — We know that cotton is a warm-weather crop, and that seed germination and early growth are best at temperatures much higher than those occurring at planting time. We know, too, that there is no escaping the need to plant as early as possible, in order to take advantage of the best weather throughout the growing season. Farmers, therefore, need varieties with built-in cold tolerance and disease resistance, and seed that will germinate quickly and uniformly.

Before we can develop varieties with these characteristics, we must learn more about cotton's inherent capacity to germinate, grow, and fruit under low-temperature conditions. And we need to learn how to preserve the capacity for vigor and cold resistance in cottonseed through growth, maturity and storage.

If we are to develop varieties more nearly fitted to climatic limits and modern cultural and harvesting techniques, we must learn how to control fruiting. Although a good deal of work has been done on environmental influences on fruiting and shedding, we still do not have adequate guides for developing better fruiting control. We want varieties that will produce more and bigger bolls and retain them to maturity. We want varieties that will bloom early in the season and develop and mature bolls quickly and uniformly.

These are problems that can best be approached through basic studies in growth chambers, where every aspect of environment can be strictly controlled. Here, in fundamental studies, scientists can separate out one by one the various factors—both in the cotton and in the environment—that influence growth, fruiting, boll shedding, and fiber development. So far, our facilities for controlled-environment work have been far too limited, but the work that has been done, in the facilities we have, has more than proved the usefulness of this basic research tool.

• **Design of Experiments**—We must design experiments intelligently, perform them carefully, and be fully alert to all possible implications of the results not only with reference to the light reaction itself but also to interactions of light with temperature, nutrition and other environmental conditions. And we must determine the relationships of all these factors to yield and quality of fibers. Then, in applied research, we can use this knowledge to build better adapted, higher quality varieties of cotton.

Along with improved varieties, cotton growers need more efficient defoliants and better herbicides. These are especially important in areas where cotton production is largely mechanized. Scientists searching for these improved chemicals are seriously handicapped by the lack of information on the reaction of the cotton plant to a particular compound at different stages of plant growth and under different environmental conditions.

Many valuable bioactive chemicals have undoubtedly been discarded during primary screening because they failed to penetrate leaf surfaces at a desired rate. Additives, such as spreaders and surfactants, sometimes help, but even here the condition of the plant surface often limits proper reaction with underlying tissues.

In developing more effective defoliants, for example, we need answers to fundamental questions like these: Why do related varieties of plants differ so greatly in their response to defoliants? What plant enzymes are active in abscission? What is the mode of action of the defoliant as it enters and moves through the plant? These questions can be answered only through basic research that will give us a broader understanding of the physiology of abscission and the biochemical relationships of the defoliant to the plant. This kind of basic knowledge on all the factors involved would open up new avenues of approach and assure more progress in the development of defoliants and other chemicals as practical and economical tools in cotton production.

• **Fiber Quality** — Increasing emphasis on quality in the spinning industry is focusing attention on the need to get at the underlying facts associated with fields deterioration of cotton lint. We all know that the surest way for cotton lint to be downgraded is to be labeled "spots." We're pretty sure of some of the causes, but we don't know yet how to prevent most of them. We know far too little about the effects of the environment on the development of the fiber or on degradation of the fiber following maturity. We need a more thorough understanding of micro-organisms and the role they play in fiber deterioration. To get this understanding, we must conduct basic research to learn the effects of these micro-organisms on the fiber under different conditions of temperature, soil, moisture, and cultural practices.

Cotton breeders are continually in need of information on the adaptability of specific varieties and strains to water stress, to nutrient deficiency, and to the deposition of cellulose in the primary and secondary walls of the fiber. They're also concerned about the quality of this cellulose as it relates to spinning quality. Only basic research can supply this information.

There's no question that improved fiber quality is the production key to expanded markets for cotton. As you know, real strides are being made in the chemical modification of fiber to give it new and specific uses. And we need more of this kind of research. At the same time, however, we should be developing improved quality in the cotton before it leaves the gin and thus help cotton compete more favorably in the textile industry.

To do this, we must learn a lot more about the structure of the fiber itself—what constistutes quality and how to combine a specific quality with high yield. Basic physiological research is urgently needed on the processes involved in fiber growth and structure and their relationship to quality of lint. The information would not only help us in developing new qualities in cotton varieties, it would also be of value to those working on chemical modification of the fiber. And the end result would be expanded cotton markets and stronger competition with synthetics.

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Diseases

Getting Uniform Stands of Cotton

DR. JOHN T. PRESLEY, Head, Cotton Disease Section, Crops Research Division, ARS-USDA, Beltsville, Md.

Failure to get a stand when planting even under favorable weather conditions has often been the experience of farmers in the Southeast. This failure may be due to many causes such as poor quality planting seed, planting too deep or too shallow, or to a diseased condition known as "damping-off."

Since a uniform stand is of primary importance in the efficient production of crops, particularly row crops, it is highly desirable to determine the cause of stand failures and to develop controls. Cold tolerance and seedling vigor are two important aspects of the problem and considerable progress is being made in the development of techniques to obtain selections with enhanced seedling vigor and cold tolerance. The behavior of cottonseed under different conditions has also been studied and is sufficiently understood for us to make reliable predictions when cottonseed of a certain quality is planted under a certain set of conditions. We, of course, can not control the climate but we can and should take advantage of every opportunity to improve our chances of obtaining a uniform stand of vigorous plants.

When planting cotton the odds of obtaining a stand are in your favor, if you wait until favorable conditions of temperature are available for rapid germination and development of the seedlings. There are also several other important steps in obtaining and maintaining a stand of cotton.

• **Seedbed Preparation** — A good job of seedbed preparation is obviously important for uniform planting and emergence.

• **Time of Planting** — Seed planted under ideal conditions for growth seem to be resistant to seedling diseases, while seed planted under adverse conditions particularly sensitive seed may fall to emerge even in the absence of disease.

• **Planting Seed** — Good planting seed can rarely be obtained from weather-damaged cotton, therefore it is especially important in years when most of the planting seed has been damaged, to get the best seed available. Cheap or poor quality seed can be the most expensive investment a farmer makes. One effective method of improving seed quality is to delint and "gravity grade." In an actual test on seed from the Mississippi Delta (1957 crop) the germination was raised from 70 percent to 96 percent at 30 degrees C. by acid delinting and removing the floaters. Only 15 percent of the seed were removed.

On the average a farmer plants three to five times as many seed as he expects to have plants in the row. The main reason for this heavy rate of seeding is that, by and large, a portion of any planting seed is not viable and a portion of the remainder will not emerge

if there is a slight drop in temperature. Buy good seed, when it is available, and use a planting rate that will give a stand of vigorous seedlings.

• **Seed Treatment** — Be sure that all the planting seed is adequately treated with a recommended seed protectant. This is particularly important with low quality seed. Non-viable seed in an untreated seed lot will actually stimulate fungus growth and thus increase the seedling disease problem. Hot water treat if "hard seed" is a problem: 170 degrees F. for one and one-half minutes. This is usually not necessary in the Southeast but has been very helpful in the Southwest.

• **Soil Fungicides** — In certain areas of the Cotton Belt the application of a fungicide as a spray or dust to the seed furrow at planting time has been helpful in reducing post-emergence damping-off by prolonging the effect of seed treatment and providing a "treated zone" through which the seedlings may emerge. In California, more than 100,000 acres were treated in 1957. In the lower Rio Grande Valley of Texas, about 30,000 acres were treated. In Texas, the average stand improvement from the use of soil fungicides was 30 percent. I believe it has been estimated by the research workers in Texas that the use of soil fungicides would be profitable in areas where seedling diseases are a problem and where the land will produce one bale or more per acre.

The moisture content of seed at planting time has a direct bearing on rate of emergence, speed of emergence and seedling vigor.

If moisture is a limiting factor, particularly at planting time, the use of acid delinted seed is recommended. Moisture uptake is a very important aspect of seed behavior immediately following planting. The drier the seed when it is planted, the slower it takes up moisture. For rapid and uniform emergence following planting, the moisture content of the seed should be in the neighborhood of 12 percent. This amount of moisture is absolutely safe so long as the storage temperatures remain below 80 degrees or if the seed are not held for more than two months at that moisture content, even at higher temperatures.

In our tests in the greenhouse where soil temperatures were favorable for rapid germination and emergence, we consistently obtained uniform stands of plants in four days. This, of course, was from good seed. Seed which has been artificially deteriorated in the laboratory to varying degrees of vigor required more time and produced less total seedlings. Sensitive seed may germinate 96 percent at 30 degrees C. and only 54 percent at 15 degrees C. Seed that germinate poorly at 30 degrees C. (86 degrees) may not emerge at all if the temperature drops to 15 degree C. (59 degrees). Thus we see that it is important to plant treated seed of good quality under favorable conditions if we are to expect a stand of plants every time. ◆ ◆

Diseases

In-Furrow Treatment For Control

DR. LUTHER S. BIRD, Cotton Pathologist, Texas Experiment Station, College Station.

The Disease Loss Committee of the Cotton Disease Council has estimated that the potential yield of the Beltwide crop is reduced each year by approximately 2.76 percent, or 428,000 bales, by seedling disease.

For many years adequate seed treatment with a proper fungicide has been used for partially controlling cotton seedling disease. Seed treatment is limited in that it does not provide protection from fungi which live in the soil after germination occurs. Thus the seedling is on its own from the seed area to the soil surface.

Research to evaluate the idea of mixing a fungicide in the soil above the seed to eliminate this unprotected zone began in 1953. Results from a number of locations across the Cotton Belt were encouraging, but not particularly striking.

Standardized tests, coordinated by the Soil Fungicide Committee of the Cotton Disease Council, were conducted across the Belt in 1954. The results of these tests were more encouraging. Of greater value was the fact that they pointed out several weaknesses in the method. The principle one was that a fungicide or combination of fungicides would have to be found which was toxic to all species of molds involved in the seedling disease complex and, at the same time, was not toxic to organisms present in the soil which are antagonistic to these fungi. Further, the fungicide would have to be effective in different soils and over a range of soil temperatures. The results also pointed out that nozzle arrangements and dust applicators which would give a more effective mixing of the fungicide in the soil would have to be devised.

By 1955 these weaknesses had been partially corrected to the extent that the method was used commercially on several thousand acres in the western area of the Belt. In 1957 it was used more extensively in the western area and to a lesser extent in the Lower Rio Grande Valley of Texas. The general impression is that planters who have used the method are satisfied and will continue to use it.

• **Texas Recommendations** — The average stand improvement of 68 percent for six tests in Texas points out the benefits in seedling disease control which can be obtained with in-the-furrow applications. As a result of these and other tests, in-the-furrow applications will be recommended for cotton seedling disease control in Texas. The initial material approvals will be the mixture of Captan plus Zineb plus PCNB at the respective rates of 1½, 2 and 2½ pounds per acre for general use, and Nabam at the rate of one gallon per acre where soils have a pH below 7.3.

An adequate fungicide improperly mixed into the covering soil certainly will not be fully effective. Improvements have been made, but this is an area where considerably more work is needed. It has been found that a two-nozzle arrangement, with one cone-type nozzle spraying the area across and about four inches to either side of the seed furrow, and the other nozzle spraying into the lapping zone of the covering soil, is more effective than any single nozzle arrangement. Also, it is as effective as other two- or three-nozzle arrangements.

Work where fluorescent powders, dyes, and radioactive materials are used to study the placement pattern, is providing valuable information for devising and arranging applicators for maximum benefit. This has shown that the two-nozzle arrangement described above gives good vertical placement from the seed to the soil surface. At the same time, it has shown that the treated zone is not wide enough. Undoubtedly, continued experiments will point to nozzle arrangements that will overcome this deficit.

The application of dusts have been erratic because of difficulties in getting accurate rates and because of the dust being blown away from the application zone by the wind. Undoubtedly, as research continues and the problem becomes more clearly defined, additional improvements will be made.

For the spray applications the materials have been applied in water at the rate of 10 gallons per acre. In many cases it is inconvenient to handle this volume of water during the planting operation. I am sure that 1958 experiments will be conducted for the purpose of evaluating the use of lower rates of water. If the material can be effectively applied in water at the rate of five to seven gallons per acre, then another step forward will have been made.

A considerable amount of testing across the Cotton Belt is being done to evaluate and select additional fungicides, and mixtures of fungicides, which will be equal to or better than those already in use. Materials are evaluated in tests on different soil types and under different environmental conditions before final judgment is passed.

• **New Materials** — Materials other than fungicides applied in the covering soil at planting have given some interesting results. Gibberellic acid applied at the rate of 10 gallons per acre of a five ppm solution gave favorable results. Here it is hoped that this hormone will not only stimulate the seedling but that it will also stimulate the soil microflora which is antagonistic to the disease producing organisms. The combined effect would tend to give disease control. The application of calcium nitrate and calcium chloride at the rate of 10 pounds per acre also gave favorable results. Published research has shown that if calcium is readily available to the young seedling, it is less susceptible to seedling disease. This apparently works when a highly soluble calcium source is applied at planting. The combinations of Nabam, and PCNB plus Captan with calcium nitrate also gave good results.

In 1958, tests with treatments consisting of combinations of fungicides with fertilizer salts and a growth hormone will be conducted. The general concept here is that the disease organisms will be inhibited by the fungicides and by an increase in the populations of antagonistic organisms which result from the stimulation of the hormone, and at the same time the presence of fertilizer salts and a hormone may cause seedlings to be less susceptible. It would be desirable for the hormone to be specific for stimulating the antagonistic organisms without stimulating the pathogen. If the hormone did stimulate the antagonistic groups and the pathogens, the antagonistic populations would be

DR. NORMAN BROWN (right), Superintendent, Southeast Missouri Research Center, Sikeston, served as presiding officer during the sessions Thursday afternoon. Speakers during the first session included (l to r) Dr. Luther S. Bird, Cotton Pathologist, Texas Agricultural Experiment Station, College Station; Dr. John T. Presley, Head, Cotton Disease Section, Crops Research Division, ARS-USDA, Beltsville, Md.; and Harlan E. Smith, Plant Pathologist, Texas Extension Service, College Station.

much greater. It is possible that this combination will give a more balanced and reliable control.

Research dealing with in-furrow treatments and the actual application of these results has come a long way since 1953. Additional results which will improve the method and make it more practical are forthcoming. It is a method which, when combined with good seedbed preparation, good planting procedures, and the use of good seed, properly treated with a protectant fungicide, will greatly increase the chances of a grower getting the desired stand with a single planting. Also, it is a practice that could make hill dropping more feasible. ◆ ◆

Diseases

What Constitutes A Good Control Program?

HARLAN E. SMITH, Pathologist, Texas Extension Service, College Station.

In any given year diseases that damage one farmer's cotton may be different from those diseases that lower the production or quality on his neighbor's cotton. For example, in the Arkansas River Valley one field of cotton may be damaged regularly by the fusarium wilt-root knot nematode complex, while a nearby farm may have root knot but comparatively little of the wilt disease.

• **Cotton Diseases Vary** — Workers familiar with cotton diseases in other states could cite similar examples. At the same time we are informed that, at least in some years, certain neighborhoods or possibly larger areas report a very similar pattern in the occurrence of cotton diseases. A good cotton disease control program may be developed for one field; however, it may be unfit for a nearby field.

In considering why cotton disease control programs may vary, we need to ask the question "How often does a particular disease have to occur in order to justify control measures?

Other factors may cause a cotton disease control program to vary from one area to another area. The level of disease severity or percent yield loss is a factor that may cause a cotton disease control program to vary.

Variation or perhaps elasticity from year to year, from field to field and, perhaps in some cases, from one part of a field to another part of the same field is one of the characteristics of an effective, practical, and economical control program. A good cotton disease control program for one year may not be good for the following year.

It would be convenient if all of the cotton farmers in a state could obtain a simple list enumerating the cotton disease control measures needed throughout the year. As an Extension specialist, I have thought of trying to prepare such a list because interested farmers and other agricultural people have requested this information. I wish cotton disease control were this simple. I think you will agree that it would be very difficult to compile a complete list of all cotton disease control measures that would apply to all growers in any state.

• **Control By Prevention** — Most cotton diseases are controlled by prevention. Prevention requires planning. Much of this planning should be done several weeks or months prior to planting. In order to simplify the formulating of a cotton disease control program the following steps are suggested:

A. List the most serious diseases that have occurred in your community during the last 10 years. These diseases are the ones that are apt to occur again. Also it is helpful to keep a record of disease occurrence in individual fields, especially those diseases whose causative agent or agents are carried over in the soil. Maintaining farm maps showing where soil borne diseases are at the present time may help.

B. Check the future farm plan with the following questions: 1. Is the variety to be grown resistant to the most important diseases? 2. Is the crop rotation so arranged to prevent a build-up of the most important diseases? 3. Is the best source of disease-free seed being used? 4. Have the seed been properly treated? 5. Will proper soil drainage prevent some diseases, such as verticillium wilt or seedling diseases? 6. Has disease prevention, along with other factors, been considered in selecting the best planting date? 7. Has proper disposal of crop residues been made in regard to disease prevention? 8. If nematodes have been a consistent, serious problem has soil fumigation before planting been considered? It may be that a small test is in order if in doubt. 9. Will kind and amount of fertilizers used help prevent the disease apt to be present? 10. Will the seed bed be prepared correctly for prevention of diseases? 11. What effect will changes in, or introduction of, irrigation have on disease build up or spread? In the case of bacterial blight, sprinkler irrigation will foster abundant spread of bacteria.

There is comparatively little that can be done after planting time to control cotton diseases except to pray. Irrigation water can be manipulated to help control certain diseases; boll-damaging insects can be controlled which, in turn, may result in less boll rot; soil can be drained to some extent to help prevent some diseases; and proper defoliation will help prevent boll rots. A cotton disease control program should be reappraised each year, especially when there is a change in the cotton disease situation or when changes in cultural practices are contemplated.

• **Educational Program** — What are some of the general objectives in an educational program on cotton diseases? It is important that the disease or diseases at first be recognized by farmers as such. Since different diseases require different control measures it is important to know exactly what diseases are involved. It is important to develop and maintain a history of disease occurrence according to individual fields. These are the diseases that are apt to occur again. In some cases maps of soil-borne diseases may aid in future control measures such as summer fallow or soil fumigation for nematode control. Disease history and maps may be an aid in evaluation of land by tax assessors.

Accurately estimating the average losses from a single disease or several combinations of disease may help in planning cotton disease control programs. Losses will be an important factor in determining how much to spend on control measures or possibly how much to sacrifice on other phases of production.

We have to spend little time in inspiring or motivating cotton growers to adapt a new practice. Once the disease is recognized, identified, and the true loss realized, most growers are very receptive to control methods.

• **Trained Personnel** — For a good many years there have been one or more full time Extension plant pathologists in most of the northern states and in many of the western states. During the last

five to 10 years there has been a trend toward employing full-time Extension plant pathologists in the cotton-growing states. The trend has helped to intensify and strengthen the over-all cotton disease educational program throughout the cotton states. A properly-trained, full-time Extension plant pathologist can be the key man in a strong cotton disease control educational program of any state.

It would be very helpful if future county agents and vocational agriculture teachers were required to have at least one beginning plant pathology course.

County agents, after starting to work in a county, should be kept informed of the latest developments in cotton disease control. The properly trained Extension plant pathologist can do this. When individual leaders in a county receive proper training in cotton disease control they are better able to adapt cotton disease control information to their own farms.

The local adaptation of control measures is important. Many progressive growers with some technical education in their background have been able to develop control measures perculiar to their own area.

An Extension leaflet or circular on the subject of cotton diseases is of primary importance in carrying on a cotton disease control educational program. It is best to have the publications on cotton diseases in the offices of county agents before attempting too much radio, TV or news releases on cotton diseases. In order to get more information many growers go to their county agent. If the agent has not been supplied a publication it slows him down in his work or makes him look bad in the eyes of the farmer.

Cotton disease educational efforts at the state, district and county level should be integrated with an over-all cotton production, processing and marketing educational program ◆ ◆

Fertilizers

New Placement Guides and Equipment

WALTER C. HULBURT, Head, Planting and Fertilizing Equipment and Practices Section, ARS-USDA, Beltsville, Md.

The National Joint Committee on Fertilizer Application has worked during 1957 on revision of their bulletin "Methods of Applying Fertilizer" which was originally issued in 1948. In the past nine years, considerable change has been made in the technique of application and equipment for field use.

The following is a summary of the recommendations submitted by the Cotton sub-committee of the National Joint Committee for the revision of the Bulletin:

• **Methods of Applying Fertilizer** — A primary problem in applying fertilizers to cotton is placement with respect to the seed row to obtain early growth stimulation without impaired germination or seedling injury and still provide an adequate supply of plant nutrients.

Methods of applying fertilizer to cotton may be grouped broadly into two categories: (1) drilled or band placement and (2) broadcast application. When drilled or banded, the fertilizer can be placed either on the surface or in the soil. In broadcasting, it may be placed on the surface, plowed down or mixed with the soil.

Humid Area

• **Placement of Solid and Non-Pressure Liquid Fertilizers** — In determining the placement of fertilizers, several factors should be considered: (1) rations of nitrogen (N), phosphate (P_2O_5), and potash (K_2O); (2) time and rate of application; (3) type and texture of the soil, and (4) weather conditions expected following application. In general, it has been found that placement of complete fertilizer in narrow bands a short distance to one or both sides of the seed row and below the level of the seed reduces the possibility of salt injury without reducing utilization efficiency. The higher the rate of application, the further to the side of the seed row and the deeper the fertilizer should be placed. The fertilizer must be near enough to the plants for utilization in early growth. Some solutions may contain free nitrogen and should be applied similarly to anhydrous ammonia.

Liquid fertilizer solutions containing one or more available plant nutrients may be applied at, or prior to planting, and as a side-dressing using the same methods and techniques for solid materials.

The following methods of placement can be expected to give satisfactory results with the rates indicated. The rate indicated may not be the maximum rate, but that at which no noticeable salt injury would be expected under most circumstances.

• **Side Placement** — The side placement or banding of complete fertilizers can be accomplished simultaneously at planting. This operation is sometimes performed during seedbed preparation. The fertilizer is placed in narrow bands approximately two and one-half inches from the seed row and between two and two and one-half inches below the level of the seed. The combined application rate of nitrogen and potash generally should not exceed 84 pounds per acre on loamy sand soils; 100 pounds per acre on sandy loams, silt loams and loamy soils; and 140 pounds per acre on clay loams and clay soils. Placement in bands three to three and one-half inches to one or both sides of the seed row and three to four inches below the level of the seed should allow for an increase of 25 to 30 percent in rate of application with no appreciable salt injury. Placement at only one side of the seed row results in a minimum disturbance of the seedbed.

The side placement of the plant nutrients, as recommended, is a precise operation and certain precautions in equipment adjustment and careful operation are required. Should a poor stand be obtained due to salt injury or other factors, it may be difficult to avoid a recurrence of this damage without extensive repreparation of the seedbed. This causes added expense, delayed planting, plus decreased fertilizer efficiency, particularly for phosphate and potash.

• **Placement in Water Furrow** — The fertilizer is placed in a narrow band in the water furrow and the land rebedded. The water furrow should be of such depth that the fertilizer will be three to four inches below the level of the seed. The combined rate of nitrogen and potash application should not exceed 84 pounds per acre on sandy loams, loams and silt loam soils; or 140 pounds per acre on clay loam and clay soils. Since cotton germinates quicker and a better stand is usually obtained when planted in a firm seedbed, it is advantageous to apply the fertilizer and prepare the seedbed and then plant after the seedbed has settled.

• **Mixed with the Soil in the Row** — The fertilizer is mixed with the soil in the row and a ridge or raised bed is formed over the fertilizer so that it will be approximately two inches below the level of the seed. The combined rate of nitrogen and potash should not exceed 72 pounds per acre on sandy loams, loams and silt loam soils or 120 pounds per acre on clay loams and clay soils. Here the seedbed should also be prepared and fertilizer applied a week or 10 days before planting.

• **Broadcast** — On soils of high fertility or where large applications of fertilizer are used, good results have been obtained by broadcast applications. The fertilizer may be plowed down or mixed with the soil prior to preparation of the seedbed.

• **Side-Dressing**—It is recommended that a part of the total nitrogen be applied as a side-dressing, because there is likely to be less loss of nitrogen by leaching, particularly on sandy soils. The side-dressed nitrogen is usually applied after the first cultivation and not much later than the early-square stage of growth.

The most essential feature for consistent effectiveness is to place the nitrogen far enough to the side of the row to avoid mechanical injury to the roots and sufficiently deep that it will not be disturbed by later cultivation. There are indications that even deeper placement of nitrogen as a side-dressing might be beneficial in dry years.

On deep, sandy soils that are also very low in available potassium, it may be advantageous to apply part of the potassium as a side-dressing to minimize its loss by leaching. If potassium is applied as a side-dressing, it should be placed at the edge of the root zone and two to three inches below the usual depth of cultivation just prior to early square formation. Where loss by leaching is not a problem adequate amounts of potash usually can be applied safely at or prior to planting by reducing the amount of nitrogen applied in the complete fertilizer to about one-fourth to one-third of the potassium.

• **Pressure Liquids (Free NH_3)**—When rates of anhydrous ammonia up to 60 pounds of nitrogen per acre are sealed six to eight inches below the seed row, there is little danger of impaired germination or seedling injury. When the opening made by the knife opener is loosely filled with soil, the ammonia is permitted to rise, thus increasing the possibility of injury. When moisture is limited and high rates of application are used, there may be injury to the seed or seedlings by movement of the nitrate nitrogen upward even though placed six to eight inches deep. Damage of this nature may be avoided by applying the ammonia four to six inches to the side and six inches below the level of

the seed drill. Where the land is to be planted flat and the ammonia applied without regard to the subsequent placement of seed, injury may be minimized by spacing the applicators 18 to 20 inches apart and planting crosswise to the direction of application of the ammonia. This reduces by about one-half the amount applied to any one opening. Early growth of the cotton may be irregular with this method of application.

The difficulty of applying ammonia increases as soils become less friable, more compact, more trashy, and as the rate of application per foot of row increases. Successful application of recommended rates of ammonia is accomplished when the soil is in the best physical condition and adapted equipment is used.

Aqua and anhydrous ammonia behave alike when applied to the soil, therefore, similar equipment and methods may be used during application. When properly applied, there is no difference in the response of cotton to aqua ammonia and anhydrous ammonia.

• **Side-Dressing** — If a quick response is desired, anhydrous ammonia should be placed in the edge of the root zone. If no nitrogen was applied before planting, the ammonia should be applied immediately after the cotton is chopped and should be placed six to eight inches to the side of the row and six inches deep. If the ammonia is to be applied as a supplement to a preplant application or to an earlier side-dressing, it may be applied further from the young plants.

In side-dressing cotton, escaping ammonia may burn the leaves of young plants. This damage is normally outgrown in a short time, but the escaped ammonia is lost.

Sub-Humid Area

• **Placement of Solid and Non-Pressure Liquid Fertilizers** — In the West, fertilizers are generally applied in bands to the side and below the seed at planting time or to the side of the young plants during the first cultivation and before the first irrigation. Occasionally preplant fertilizers are banded in the bed, with precautions taken to prevent planting directly over the fertilizer band. Broadcast applications are sometimes used prior to planting or after emergency and the fertilizer is worked into the soil during cultivation.

Broadcast applications of dry fertilizer, full coverage injection of solutions or fertilizer applied in irrigation water are usually less effective than banded or side-dressed fertilizer.

Fertilizers applied to cotton at planting time should be placed at least three inches to one or both sides of the seed row and approximately two inches below the seed level on soils of medium to heavy texture. On soils of light texture, it is necessary that the band be further removed from the seed row to prevent salt injury. An alternate practice is to apply the fertilizer as a side-dressing when a satisfactory stand has been assured and before the first irrigation. The fertilizer should be applied at the outer extremes of the lateral root extension four to six inches to the side of the plants to avoid mechanical injury to the roots, and at a depth so that it will not be disturbed later during cultivation. Where furrow irrigation is used, the fertilizer should be placed below the level of the water.

For preplant applications the fertilizer band should be deeper in the soil than for banded applications on the side of the seed row. The seed should not be planted directly over the fertilizer band.

On severely deficient soils, the nitrogen application may be delayed until the plants are well established and losses from seedling diseases minimized. Phosphate materials, however, should be applied as early as practicable, but it is often preferred to withhold applications of nitrogen and phosphorus until a satisfactory stand is obtained.

Fertilizer placement on light textured soils is critical. The fertilizer band placed seven inches from the row in sandy soils is more effective than wider spacings. On heavier textured soils, placement is not critical and significant differences have not been obtained between seven inch and 20 inch placement.

General fertilizer recommendations are usually impractical in the sub-humid area because of the diversity of soils and cropping conditions encountered.

Nitrogen use varies from zero to 200 pounds actual nitrogen per acre and normally 40 to 60 pounds actual phosphate are sufficient. However, use of phosphate varies from zero to 80 pounds. Potash is unsually in adequate natural supply and should not be used alone. In some cases, it has actually caused yield reduction when used in cotton with adequate amounts of nitrogen and phosphorus.

• **Side-Dressing**—Side-dressed fertilizer should be applied far enough to the side of the row to prevent mechanical injury to the roots. Distance from the row must vary with the kind and amount of fertilizer, soil conditions and plant size. With furrow irrigation, the fertilizer should be placed below the level of irrigation water. No significant differences have been found in side-dressing with nitrogen on one or both sides of the row, but phosphorus is more readily used from applications on both sides of the row.

Applications of nitrogen and sometimes nitrogen and phosphorus are made in irrigation water when it is impractical to apply fertilizer by other methods. Fertilizers applied in water or by broadcast applications are usually only partially as effective as materials applied by side-dressing.

Split applications of nitrogen are often used where leaching is a problem. Ammonical nitrogen sources are most frequently used under these conditions with half the nitrogen applied soon after planting and the balance in advance of early flowering. On soils of loam or clay texture, applications of fertilizer need not be split.

• **Pressure Liquids (Free NH_3)** — In the West, experience has shown that it may be hazardous to plant cotton directly over six to eight inches deep preplant application of anhydrous ammonia. Applications which allow diffusion of ammonia into the seed row or root zone of small plants should be avoided. Similar equipment and techniques used in applying anhydrous and aqua ammonia to cotton in the humid area are applicable in the sub-humid section.

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Fertilizers

More Efficient Fertilization

DR. RALPH L. WEHUNT, Agronomist, Georgia Extension Service, Athens.

We are living in an age of constant and frequent changes. Agriculture, to maintain its rightful place in our total economy, must be willing and ready to accept the tools of better farming based on scientific know-how. This problem is basic to the farmers as well as to the consumer. For example, consumers today would pay at least $10 billion more annually for food if farmers farmed as they did in 1940. It is estimated that

THE SECOND SESSION Thursday afternoon included discussions on a team approach to more efficient cotton fertilization and the effect of current practices on cotton's spinning performance. Participants included (l to r) Dr. Ralph Wehunt, Agronomist, Georgia Extension Service, Athens; Dr. Norman Brown, presiding officer; Vernon P. Moore, Production and Marketing Division, National Cotton Council, Memphis; and Walter C. Hulburt, Head, Planting and Fertilizing Equipment and Practices Section, ARS-USDA, Beltsville, Md.

The First Little Miss Cotton!

Meet an eight-year-old ambassadress of cotton—little Miss Linda Finke (rhymes with pinky), the first Little Miss Cotton.

Linda won her title in Memphis last spring. Later, two other youngsters won Little Miss Cotton titles in Philadelphia and Birmingham. These three contests were forerunners of a 30-day Little Miss Cotton promotion planned for 1958 by the National Cotton Council. The national winner will be given an all-cotton back-to-school wardrobe created by famous designers.

All of which is expected to boost the sales of juvenile cottons substantially. According to the Council, cotton already holds 77% of the infant-through-teenage market. And with an increasing birth rate plus Little Miss Cottons to push sales—young cottons will grow—and grow—and grow!

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fertilizer alone accounts for $2 billion of the $10 billion total annual savings from improved farming efficiency. We cannot stop educating our farmers to greater efficiency just because we have a surplus problem—we must stand ready to meet the challenges of a better tomorrow. America's industrial progress is made possible through efficient production—the same principle applies to farming.

We cannot take it for granted that our farmers are hitching science to the plow. We have a wonderful story to tell—all of us. But we must conduct educational programs with greater vigor—with greater forcefulness—and with greater zeal—if we are to continue as the best fed—the best clothed—and the best housed nation in the world.

Basically, all educational programs involve only three concepts. First of all, a need must exist for the program. Secondly, adequate facts and figures must be accumulated and third the program must be put into action. The word *action* is the "stop signal" for most educational programs. A drastic need may exist for a program and we can accumulate facts and figures until the end of time—but until someone is bold enough to face the general public with a dynamic plan of *action* very little has been accomplished.

It is at the point of action that real teamwork comes into play on an educational program. It is here that long hours of planning are required. An action program without sound and careful planning is as fragile as butterfly wings under a steam roller and as futile as a dewdrop in a blast furnace. Many of our present-day educational programs are not too well-planned and are thus as outdated as the Model-T Ford. Our farmers today have TV, radio, high-powered automobiles, and many other things to occupy their time. We must realize and face this competition with action programs so well-planned that they will break the barrier of "I Love Lucy," "Ed Sullivan," and other factors which occupy their time.

Also, we must realize that farmers—good and bad, big and small—are primarily business men. Cold, hard business analysis and critical appraisal in terms of "Why should I do it" and "What does it mean to me," are the type questions farmers ask about anything—especially anything that involves spending their money. Statements about state or community needs and benefits are good to show things in their broad light. Also, explanations about what it can mean in the future helps to pinpoint the need—but the appeal for—the reason why—and profit motive for the very immediate future is the only type program that can get full support and create concrete action. We should appeal to the farmer on terms of immediate benefit to him—with action programs that hit the "bull's-eye" square in his pocketbook.

I believe most educational programs involve three basic factors—a *need*, the *facts*, and *vigorous action*.

• **Georgia Program** — Let me review with you a fertility program which we have recently launched in Georgia. Although this program has been termed unusual in its approach by some people, we feel it does not involve any new concepts—except greater intensification of known methods and emphasis on the *action* phrase. We are also aware that the program is not perfect and thus welcome any ideas or suggestions from this group to improve it.

This "Intensified Soil Fertility Program" is now under way in six counties. The leader of the program in each county is the county agent with assistance from the State Extension Specialist Staff. The project in the six counties is part of the $200 Million Soil Fertility Program being promoted throughout Georgia.

The program has full backing from the fertilizer industry. The Georgia Plant Food Educational Society has assigned six agronomists to work on the project. These men will give talks and work on the project in much the same manner as the Extension Agronomists. The National Plant Food Institute is helping to support the program through a grant of funds and also will share a substantial part of the cost of a comprehensive study to evaluate the results of the program. Many individual companies at the national, state, and local level are supporting the program with funds and demonstration materials.

The primary objectives of the intensified fertility program are: (1) to cause farmers and business leaders to become conscious of the major role fertilizers and lime can have in making a better Georgia agriculture, (2) to assist farmers in carrying out the best-known fertilizer and lime practices and (3) to increase farm, industry, and business income by sound fertilization methods.

Let us now examine this program on the basis of *need*, *facts*, and *action* with special emphasis on the word *"action."*

Does a need exist for such a fertility program? My answer to that question is an emphatic "Yes." Sound soil fertility is the very backbone of an expanding agriculture. Poor soils mean a poor agriculture—it is just that simple. Wise use of the soil should be of vital concern to everyone—those on the farm and in the city. Everything man eats, drinks, and wears—even the house he lives in—comes from Mother Earth. The soil is the eternal treasury of mankind. It, like faith, is the substance of things hoped for, the evidence of things not seed. It is our hope that every man, woman, and child in the six intensified soil fertility counties will become more aware of the *"need"* for sound soil fertility. Better soils will truly provide them with all the good things of life—yes—even life itself.

• **Local Facts** — Let us briefly review some of the facts which will be presented to the people on an individual county basis.

1. The fact that successful crop production depends largely on wise use of fertilizer and lime will be stressed.

2. Attention will be focused on low soil fertility conditions in the six counties. In some of the counties, approximately 80 percent of the soils are low in potash and 90 percent are too acid for optimum crop production.

3. Figures on present fertilizer use and that needed for the most profitable production will be shown. Also, it will be emphasized that many farmers are using the wrong kind of fertilizer.

4. It will be pointed out that average per acre yield of crops is too low. Cotton yields could be increased 40 to 50 percent in the counties by more efficient fertilization.

5. The fact that fertilizer is one of the farmer's biggest bargains will be underscored. Land values, interest rates, taxes, cost of machinery, and labor have all increased to much greater values than fertilizer in recent years. They will be informed that proper use of fertilizer can give returns which are almost unbelieveable to the average investor.

These facts may seem elementary to you—but to the farmer they are not. I base this statement on the remarks of many farmers and others who have seen and heard these facts. The story told in an action program should be simple. It should be repeated again—again—and again. Our farmers today have a real *need* for *facts* presented quickly, accurately, and in easy-to-understand language. We have an abundance of information with which to focus attention on the importance of fertilizer to the economic well being of our agriculture. However, our big job is to develop programs of *action*, and to release this storehouse of knowledge on the farms where it can be put into use.

• **Action** — Let us now view Georgia's Intensified Soil Fertility Program from the standpoint of action. An action program involves leaders from the farm, business, and industry—men who are not willing to accept defeat—men who are willing to promote new ideas and to revive those principles which can help make a permanent farm security. A list of action ideas which we have found worthwhile are:

Present program to county program development committee and obtain their full support.

Form a county soil fertility work group from the county program development committee, consisting of farmers, business leaders, newspapers editors and others.

Present program to all organizations in county, such as civic groups, community clubs, home demonstration clubs, 4-H clubs, Farm Bureaus, and others. Enlist their aid on some phase of the campaign. For example, establish "high fertility" farms, sponsor county-wide fertilizer contests, or develop a 4-H Club exhibit day.

Develop a soil fertility day or week. Enlist aid of all business groups. For example, a special sales day by business concerns. A square dance may be held called "Soil Fertility Hoedown" to climax the day or week.

Have a 4-H Club soil fertility exhibit contest. For example, prepare exhibits and window displays for stores. Local fertilizer dealers or civic clubs may be willing to sponsor such a contest.

Prepare radio tapes. For example, have several county leaders endorse the program and also interview farmers using good fertilizer practices. Tapes should also be prepared by Extension agronomists and county agents on various subject matters.

Plan a special newspaper release on fertility program. In the release, urge business leaders to support the fertility program in regular or special advertisements. Work with local newspaper editor on this suggested idea.

Appoint farm leaders or Farm Bureau units in different communities to act as soil sample information agents. Supply them with bags and information sheets to pass out to farmers.

Develop TV shows on soil fertility program.

Organize a direct mail campaign for farmers on fertilizer and lime practices and needs.

Visit farms and discuss program with individual leading farmers.

Enlist full assistance of fertilizer in-

dustry in establishing demonstrations, direct mail programs and in personal contacts with farmers.

Make intensive use of all films and slides on soils and fertilizers.

Prepare a feature exhibit on program to point up the importance of fertilizer and lime as a major factor toward improving county economic welfare. This exhibit could be set up in a central area such as the courthouse.

• **Cooperation** — In addition to this intensified program, successful farmers and ambitious youths in Georgia are helping to spread the gospel of better cotton practices. About 10,000 farmers took part in the five-acre cotton contest over a nine-year period. More recently, 52 farmers were made charter members of a Bale and Half Per Acre Program. They produced an average of 860 pounds of lint per acre. About 3,000 4-H club members have cotton projects annually. These people have the resourcefulness and ambition to try new methods of cotton production. Those demonstrators are the "homerun" members of our team.

Our job of increasing the efficiency of farmers is never ending—it is a job which involves people from all walks of life organized as a team with the will to win. Our goals of more fertile soils and efficient yields must also include human relationships. Our efforts to provide better soils must be accompanied by the development of better schools, finer churches, more public-spirited organizations, and happier homes—all filled with better people.

I mean people filled with self-confidence, self-respect, self-reliance, concern for the rights and needs of others, and a genuine, active interest in neighborliness and plain good will toward all men. ◆ ◆

Effect of Practices On Spinning Performance

VERNON P. MOORE, National Cotton Council, Memphis.

During the past 10 years, mill machinery and equipment costs and taxes have increased as farmers' costs have; mill labor costs have increased 30 percent while the price of cloth has dropped 20 percent. Because of this, mills tell us that the only way to stay in business is to increase efficiency and in doing so they are demanding more of cotton than ever before. They are achieving efficiency by: (1) Higher speeds in carding and spinning; (2) Larger packages to increase operating time of equipment and reduce labor costs; and (3) Operating close to the extreme spinning limit of the cotton. This last point is more significant in that it indicates that there is a smaller safety margin to prevent trouble in spinning. Small differences in spinning performance which have gone almost unnoticed several years ago are now of major importance.

Cotton, machines, and people in the mill are all operating very close to their maximum limits. Among other things, this means that cotton must be selected with more care to assure trouble-free operation and product quality. This also means that the cotton manufacturer will make every effort to buy cotton which has the best running characteristics consistant with price.

• **Mechanization** — As our industry has moved rapidly toward greater mechanization we solved some problems and created others. In an effort to solve some of these new problems the USDA, through the cooperation of its different agencies, has studied the effects which some of the various new practices have had on cotton quality. During the early days of mechanical picking, a concerted effort was made on the part of the ginning laboratories and experiment stations to obtain information on comparative costs and effects on quality of hand and machine picking to guide industry and place this new development in its proper perspective. It became apparent that good machine picking did not adversely affect the spinning performance of Upland cotton. The manufacturing waste was higher because of the increased trash content, but yarn quality was not adversely affected.

As gin cleaning equipment was improved and became more efficient, the manufacturing waste difference was also reduced to a point where differences between hand and machine picked cotton from the same field were usually less than three percent. Yarn quality in some instances was actually higher for machine picked cotton. This was attributed to the fact that the machine does not pick "tight locks" which are harvested by hand pickers. There were carefully controlled demonstrations of what could be done, but adopting these findings into commercial operations takes time and a lot of education.

Research has pointed out repeatedly that the job done by the mechanical picker and the resultant quality of the cotton are dependent to a large extent upon weed control and defoliation.

Some grass can be removed by various mill operations, but that which is not removed causes operational difficulties in spinning and weaving and, therefore, added costs. A small amount of grass in the lint can cause large price discounts to the producer.

• **Defoliation** — Defoliation has received a great deal of attention over the years. Everyone agrees that a good job of defoliation, if we can get it, will pay dividends. But just when to apply the defoliant to obtain best results and avoid adverse effects on yield and fiber quality is not too clearly defined. Tests have shown that an early application of defoliant will effect the growth of the cotton plant and thereby cause excessive fiber immaturity. The immature fibers will tangle quite easily causing neps and consequently, low quality yarns and fabrics. Late season irrigation in combination with an early frost, which is uncontrollable, will also tend to reduce fiber maturity of the late crop. Good insect control is a must to obtain high yields and research and experience show that a machine works best in high-yielding cotton. Also, such things as plant population, diseases, fertilization, and irrigation cannot be overlooked from a quality standpoint.

Numerous tests have been made to compare the possible effects of such practices as hill dropping, cross plowing, drilling and chopping, and flame cultivation on lint quality. Several years' data have failed to show that these practices have any measurable effects on quality.

A rather comprehensive series of studies has shown that the moisture content of the seed cotton on the stalk has a marked effect on grade. As much as a full grade difference can be expected between early morning damp cotton and dry cotton picked from the same field during the afternoon. This is significant from the farmers standpoint, but it is just as significant from the standpoint of quality preservation.

• **Cumulative Effects** — The preservation of the inherent spinning quality of cotton does not just happen. It requires the careful planning of the farmer and cooperation of the ginner. It should be remembered, the gin does not make quality, it can at best only preserve it. Quite often the effects of practices which we have pointed out here are cumulative. For example, conside this chain of events. Because of weather conditions or improper irrigation, we may have in effect, two crops of cotton on the stalk. The insect control program hasn't worked out too well and we have had a build up of aphids. We defoliate early to save the bottom crop from boll rot and this causes the top crop to be immature. We put our pickers in the field early in the morning before the dew is off and the cotton twists and ropes. There are numerous picker twists.

In an effort to obtain a smooth, reasonably clean sample, the ginner turns the heat up. Part of the bale is overdried because some of the dew had dried off by the time the second basket is picked. When this bale is classed and sold it doesn't look too bad, the grade may be slightly higher on one side than the other. The staple length will be slightly longer on the opposite side of the bale. This is caused by the variation in moisture content at time of picking and ginning.

The merchant measures the micronaire of the cotton and it is found that it is slightly finer than the average of the crop in the area but not enough to make any particular difference and so it goes unnoticed. *However, when this bale reaches the mill it completely breaks down.* The immature fibers, the over-drying, the picker twists, and the honeydew, when added together, result in high nep count, high manufacturing waste, yarn strength below specifications, yarn appearance below grade, and on top of all this, the roving sticks to the drafting rolls, thereby increasing the labor required to keep the spinning frames running.

These practices are not good individually. With our present knowhow some are almost unavoidable, however, cumulatively they can be disastrous to a producing area as well as the spinner. It doesn't take very many bales like the one just described to put a black mark on an area which prides itself in producing quality cotton.

To prevent such things as this requires cooperation and research and doing the best we can with what we have. We know a good bit about the individual effects of various practices but very little about the complications which could come from the cumulative effects of insect control, production practices, harvesting equipment, ginning. Research of this type is badly needed and long overdue.

• **Measuring Quality**—Basic to any research program on cotton is a means for evaluating the results. Rapid, economical measurements for the potential spinning performance of cotton is one of

our most crucial needs. More and more, people are convinced that if a practical solution is found for this one, many of our problems with respect to the relationship of production, ginning, and marketing to manufacturing will clear up rapidly. A better yardstick for measuring quality would mean much to the whole field of raw cotton and moreover, it would provide an incentive for quality.

Today, when a farmer decides what cotton to plant, the cultural practices to follow, or what care to take in harvesting, we surely can't expect him to be influenced by any quality considerations other than those which will be measured in the channels of trade and for which he gets a premium. When a gin machinery manufacturer sells a piece of equipment, or the ginner buys and operates it, we can't expect either one of them to be too much concerned with any kind of quality besides that which the merchant will measure and pay for when he buys the cotton. And, the merchant can only use those tools of measurement which are actually available on a practical basis.

On the other hand, if we had adequate tools for evaluation, think what it would mean to everybody, everywhere, who is doing research in which the quality of raw cotton is involved. Think of the cotton breeder, the irrigation engineer, the entomologist, the ginning engineer, or the farm implement manufacturer, just to name a few. Without adequate means for measuring quality, how can we expect these people to be too concerned with the effects of their devlopmnts upon the quality of cotton and translate these effects into what they really mean to the industry when we can't really tell them how to measure quality in the first place? Only with spinning, weaving, and dyeing tests can we come reasonably close to giving a meaningful measure of what a development would mean to cotton, and these are often feasible only after the research has gone to a very advanced stage. So, this problem reaches throughout our industry. If we had practical ways to quickly and inexpensively measure more of the real quality of raw cotton, we could revolutionize the efforts which are being made to improve and preserve quality. This all boils down to the basic fact that we need research to provide tools for research.

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Developing Efficient Irrigation in Rain Belt:

Irrigation

Essential Physical And Biological Considerations

DR. WILLIAM A. RANEY, Soil and Water Conservation and Research Division, ARS-USDA, Beltsville, Md.

There is probably not a single unirrigated farm in the U.S. on which crop production efficiency could not be improved by using irrigation as a production practice. Even though this fact has been realized for only a short time, acceptance of the practice is substantial.

The irrigated acreage in the 31 Eastern States represents only a little more than nine percent of the total in the country but this acreage is increasing rapidly. Between 1949 and 1954 the irrigated acreage increased 70 percent and there was a further increase of 28 percent between 1954 and 1956.

Since irrigation requires large amounts of water, the impact of its continued expansion must be considered. At present, about half of the water used for all consumptive purposes in the U.S. is in irrigation, even though only about seven percent of our cultivated land is now irrigated. At present, four percent of this irrigation water is used in the 31 Eastern States which contain three-fourths of the total national population.

Urban and industrial users can afford to pay higher prices for water than agricultural users. This automatically establishes lower priority for the latter group. In order to realize maximum benefit from water allocated for irrigation, an efficient irrigation program must then be developed. An efficient irrigation program depends on: (1) the efficient development of water-resources, (2) the efficient recharge of diminished soil-moisture reserves during rainfall-deficient periods, and (3) the efficient utilization of water by plants in the synthesis of tissue.

• **Water Resource Development**—Water resource development involves both surface and subsurface resources. The former is usually concerned with the construction of means of preventing or retarding loss of runoff water while the latter is concerned with controlled drainage of saturated aquifers.

In either case there must be an annual recharge of the storage facilities or the supply will be permanently depleted. The life of a project which permanently depletes the water supply depends upon the size of the supply or upon the ability to use water from some other storage basin.

• **Preventing Loss** — The loss of water that has been impounded is by no means insignificant. Losses by evaporation from ponds and lakes average five to six feet each year and a similar amount is lost by seepage out of the reservoir. The use of chemicals to form barriers to evaporation has met with limited success. Materials such as the long carbon chain alcohols are effective barriers to evaporation at low temperature but their effectiveness is greatly diminished at high temperature; moreover, these materials will not form a permanent layer across the surface of a pond or lake. They must be dissolved in a suitable solvent and reapplied frequently. The use of plastic covers has proved effective in reducing evaporation but mechanical, economic and other problems such as deterioration on being exposed to sunlight, must be overcome before they may be utilized for reducing evaporation losses. The current status of research on the diminution of evaporation extends hope that the problem is surmountable.

Seepage losses are as perplexing as evaporation losses. Mechanical means of compacting the surfaces of water-impounding structures made of soil are considered the most reliable means of reducing seepage losses. When these fail the addition of some foreign material to reduce the hydraulic conductivity of the soil surface is essential. Sandy-clay soil can be compacted into a less permeable mass than any other textural class of soil and is usually preferred as dam construction material or as a mantle on the floor of the pond or lake. The use of dispersants to cause a breakdown of soil structure into a less permeable mantle has met with some success. The sodium phosphates and silicates are usually preferred as dispersants because these materials can also deactivate any calcium or magnesium ions that might be present and which would have a flocculating effect. The use of dispersants is generally limited to high lime soils and not to acid or alkali soils.

The reservoir design has a rather profound influence on evaporation losses. The fraction of the stored water that is lost by evaporation is reduced as the surface/volume ration of the reservoir is reduced. A deep reservoir with a small surface area would then be more efficient than a shallow reservoir extending over a large area.

Conveyance losses are, like surface reservoir losses, predominantly those of evaporation and seepage. Both types of losses are eliminated when water is transported in closed pipe but the initial cost of closed conduits delays their acceptance. Canal liners to reduce seepage losses look promising and may, when fully and economically developed, increase conveyance efficiency or the fraction of the water that is drawn from the reservoir which reaches the desired farm.

• **Application Efficiency** — At one time application efficiency was considered as the fraction of the water which was delivered to a farm that moved into the soil. Soil moisture that was stored was measured as the difference between inflow at the farm head-gate and the outflow at the drainage ditch. This concept did not include considerations of root zone moisture depletions or recharge. Vaughn Hanson recently suggested that the fraction of the depleted moisture reserves that were recharged and the fraction of the diverted water which was used to recharge those reserves would be better indices of efficiency of application. These ideas recognize under-irrigation and over-irrigation as equally undesirable.

As an index of water utilization efficiency the concept of expressing the end product as a fraction of the intial product, as was done with resource development and distribution, is not entirely satisfactory. Such a concept would recognize as equally efficient all crops and conditions in which a high percentage of the water that was stored in the root zone was transpired by plants.

Crop plants themselves and their environment influence the ability of those plants to use water in the development of tissue. It is therefore necessary to include the efficiency of use as well as the efficiency of water uptake as an index of water utilization efficiency.

Only about 50 percent of the water that is diminished from the soil profit is removed by plants. The remainder is lost through evaporation or by movement out of the root zone. It is reasonable to use the total depletion of water

from the root zone, however, in computing water utilization by plants.

Since water use is essential in tissue development by plants, water use efficiency may be defined as units of dry matter produced per inch of water removed from the soil profile. When so defined, water use efficiency is closely related to total dry matter production. Anything that increases one increases the other. Whenever fertility, stand, weed and insect control, drainage or soil-moisture supply are inadequate, water use efficiency is diminished. This close relation between dry-matter production and water use efficiency holds for a wide variety of crops but economic returns are not always related to dry matter production. Where the reproductive part of the crop, such as seed-cotton, is the harvested part, it is imperative not only that there must be a large amount of dry matter produced per acre but also that a maximum amount of the dry matter be the harvested part.

The separate effects and some of the interactions of factors which affect the pounds of dry matter produced per inch of water removed from the soil profile must be considered.

The genetic constitution of the plant species has an influence on the efficiency of water use. Plant species which are adapted to a cool climate cannot use water efficiently in a hot climate because they tend to become dormant at high temperature. There is a difference too within hot or cold climate species in their efficiency of water use. Genetically adapted species must be determined for each climatic condition.

• **Nutrients Uptake** — Soil itself may limit efficient water use. Whenever plants are unable to obtain, from the soil, adequate amounts of water, nutrients, or oxygen, total seasonal growth is invariably reduced. These three constituents control fruit set and development as well as over-all plant growth.

There are indications that uptake of nutrients, water, and oxygen are not unrelated. A large part of the water which is absorbed by plants enters through parts of the root tissue where no semi-permeable membranes are involved. Ions may be swept in with the water in such places and be transported up the stem in the conducting vessels along with the water. Entry of water and nutrient ions into and transport through plant tissue represent extremely complex phenomena which need still further clarification.

Oxygen uptake is confined largely to the growing tips of roots where aerobic respiration is essential to root growth. The very process of growth exposes new supplies of water and nutrient ions to the roots and renders them susceptible to absorption. Poor aeration, which is largely responsible for inadequate root development, is generally eliminated by land forming or other practices essential to adequate water control.

Crop management practices such as fertility control may alter water use efficiency Whenever nutrients are deficient, adequate fertility management results in large increases in dry matter production without markedly increasing water uptake. This results in rather striking increases in efficiency of water use. In like manner fertility management has a marked influence on the portion of the total dry matter that is vegetative or reproductive.

Inadequate weed or insect control may, by interfering with water and nutrient uptake or otherwise altering fruit set, shift the plant from reproductive stage to vegetative stage of development and result in economic loss even though the total dry matter production per inch of water is not appreciably altered.

• **Moisture Management**—Soil moisture management, which includes recharge of the moisture depleted profile as well as control of the extent of depletion prior to recharge, presents many problems. Recent investigations have indicated that maximum allowable soil moisture stress is, by itself, not an adequate criterion for controlling irrigation timing. The rate of water uptake by plants is controlled both by soil moisture stress and by the water transmission characteristics of the soil itself. Even though the distance over which water is transmitted is small, water must move to the root interface to replace that which is absorbed before any more can be taken up at a given place on the root. The relative importance of soil moisture stress and unsaturated flow rates on moisture uptake are probably determined by evaporative conditions at the leaf surfaces.

Evaluation of soil moisture stress in the root zone and of water transmission characteristics of the soil as a function of soil moisture stress must be made indirectly. Moisture transmission and retentivity are determined simultaneously on soil samples which are taken from the field, the flow rate curves being constructed from the outflow characteristics of samples as the soil suction is increased from one increment to the next. Soil moisture is estimated in terms of content and the two curves used to translate these data to stress and water transmission values.

The efficient use of water resources is determined by the efficiency of development of the water resources, the efficiency with which the water is added to the soil where needed, and the efficiency with which the water is utilized by crop plants in the development of dry matter.

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Irrigation

Essential Managerial And Economic Considerations

DR. GRADY B. CROWE, Agricultural Economist, USDA-Delta Branch Station, Stoneville, Miss.

The use of supplemental irrigation in humid areas probably has more potential impact on cotton farming systems than any technological innovation since the introduction of the all-purpose tractor. It changes both the capacity and efficiency of the factors of production in their relationships to one another. In fact, to use it with maximum efficiency will require modification of almost all production inputs and all operations in the crop-production sequence.

• **Crops To Be Irrigated** — In general,

DR. JOHN A. EWING (left), director, Tennessee Experiment Station, Knoxville, served as presiding officer for the sessions Friday forenoon. Speakers at the first session included (l to r) Dr. William A. Raney, Head, Irrigation and Drainage Section, Soil and Water Conservation Research Division, ARS-USDA, Beltsville, Md.; Dr. Grady B. Crowe, Agricultural Economist, Delta Branch Experiment Station, Stoneville, Miss.; and Dr. J. C. Gaines, Head, Department of Entomology, Texas A&M.

those crops with high gross value per acre can be expected to yield the greatest returns to the use of supplemental irrigation. In farming systems in the Midsouth, cotton is a natural in this respect. It is usually unwise, however, to use one crop as a basis for the decision to introduce supplemental irrigation. The possibility of extending the use of the irrigation system to other crops offers opportunity to spread overhead costs and increase the efficiencey of the practice.

• **Scale**—Scale of operation affects irrigation in much the same way that it affects other operations in mechanized production. Small equipment, small heads of water, or small acreages always lead to high costs of irrigation.

Given proper management and the necessary equipment, there is little doubt that some financial return would accrue to irrigation even on small farms. However, whether many farms of this size could provide a living for a farm family and liquidate capital investment requirements is doubtful.

• **Yield Stability and Risks** — One obstacle to effective planning of agricultural production is the variability of output from given in-puts. Ordinarily, a producer is not able to estimate the effects of a certain amount of in-puts. He can only guess the limits within which the response may occur. This situation makes him cautious in his attitude toward new practices. This is especially true if his supply of capital is limited in any way. If supplemental irrigation can reduce this uncertainty, and indications are that it can, it will have made a contribution that will affect both the breadth and rapidity of progress in agriculture. Risk has long been a retarding factor in the acceptance of technological change.

Data to support the proposition that irrigation can reduce production uncertainties in the rain-grown areas are very scarce, but one or two instances might serve to illustrate the point.

Observations from three different cotton-yield tests in the Mississippi Delta over a three-year period indicate that nonirrigated cotton yields varied eight percent from the average while irrigated cotton varied only five percent. A similar test in Alabama covering three years shows a 35-percent varation for nonirrigated cotton compared with a two-percent variation with irrigation. Yields of corn in Mississippi varied one percent with irrigation, and eight percent without.

• **Management and Labor** — The factor that requires the greatest intensification with irrigation and a high level of inputs is management. Production problems in cotton today are beginning to turn more and more on management and the level of skills of labor. It is the considered judgment of production specialists that the applications of "stepped-up" production practices would result in negligible returns if no improvement is made in management and labor. It is not enough that policy determinations and management decisions be properly made. Improvements must be made also in application techniques and job performance.

Jobs associated with the use of supplemental irrigation are tedious and backbreaking and are usually performed under hot, muddy conditions. Present workers on plantations have not taken kindly to the use of the practice. Apparently, higher wage rates do not offer a full solution. Until management acquires more complete knowledge and labor more experience, there is an area here of management-labor relations that will present something of a problem.

It is interesting to note in a Mississippi study of irrigation that the most important factor affecting labor requirements and cost, regardless of the source of water or the application method used, was the *planning* and *management* of the individual operator. This was evident from the fact that the more efficient operators using each application method had lower costs than the bulk of the operators using any one method.

• **Sources of Water** — Once the decision to irrigate has been reached, it becomes necessary to consider alternative sources of water. Obviously, a dependable and convently located surface source of water will be cheaper than a well. It must be remembered, however, that the dependability of a surface source is in inverse proportion to the number of producers who think it dependable and are able to use it. Many streams have been pumped dry during periods of critical water needs. Location, too, is extremely important. Where water is transported in pipes it takes an investment of $100 to $175 to move it 100 feet. The use of open ditches is cheaper but they present a problem in repair and maintenance.

In the alluvial areas of the Midsouth, wells have proven to be a dependable and fairly cheap source of irrigation water. It is possible to drill a well to supply 2,000 gallons of water per minute and equip it with a pump and motor for roughly $5,000. Such an installation can be expected to supply water for approximately 200 acres of land. Therefore, it would represent an investment of about $25 per acre.

The cost of pumping water would, of course, vary with the need for irrigation from season to season. Present indications are that these costs, which include depreciation and annual operating costs for the pump and power unit on the well, would run about 25 cents to 35 cents per acre inch.

• **Alternative Distribution Methods** — The type of distribution system used will be influenced greatly by conditions on individual farms. The main choice lies between sprinklers and gravity systems such as gated pipe, siphon tubes, and other furrow irrigation systems. Sprinklers require a relatively heavy investment in equipment somewhere around $80 per acre. They usually require more labor and the operating cost is higher than costs for other systems. Their chief advantage lies in the fact that they can be used on fairly rough topography, that is, on land that could not be leveled readily for the use of gravity systems. Although gravity systems are usually cheaper to operate, as a rule, they require considerable more land preparation.

The cost of land forming varies from almost nothing to $100 per acre, depending on topography and the amount of soil to be moved. Of the gravity systems, gated pipe requires more of an investment and has a higher operating cost. Siphon tubes and the contour-check method appears to be the most economical, once land forming costs are out of the way.

A recent study in Mississippi indicates that the cost of applying water to row crops ranges from about $3 to $10 and averages about $8 per acre per application.

• **Changes in Investment and Costs** — Superimposing irrigation on mechanized cotton production will tend to raise investment and operating cost per acre to even higher levels. On a Delta cotton plantation the total investment per acre of cropland could easily go to $425 per acre. Investment in cotton production equipment per acre of cotton could be almost double that of nonirrigated cotton production.

Production expenses per acre would increase in a like manner. With the use of supplemental irrigation and a high level of in-puts, cost of producing cotton on some farms have already risen above $200 per acre. However, since unit costs are such a great function of yield, production costs per pound probably would remain about the same or they might even be somewhat lower.

• **Needed Returns** — As yield responses to irrigation are likely to vary widely from farm to farm, one way of establishing benefits is to determine the increase in yield necessary to cover the cost of the practice. This was done for selected crops in a recent study in Mississippi, which covered the 1956 production year. Based on an average of two applications of water and taking into account increased costs of weed and insect control and of harvesting, it was found that increases in yield of roughly 217 pounds of seed cotton, 15 bushels of corn and seven bushels of soybeans would be needed to cover the direct and associated costs of supplemental irrigation. Naturally, any increases in yields above these indications represent returns to irrigation.

• **Effects on Production Practices** — If anything like the full potential of irrigation is to be realized, a critical and full re-evaluation of the whole gamut of production practices must be made. This means that the removal of soil moisture as a limiting factor will be used to exploit the interrelated and complementary effects of all other production practices used in growing cotton. Deep tillage, plant populations, fertilization, insect control, disease control, weed control, and management will need to be reevaluated and intensified.

In fact, the need for intensification of certain practices is already evident. Tests at the Delta Station indicate that irrigation without proper insect control may actually reduce yields. To protect prospective high yields and to reduce risks associated with extremely high levels of in-puts, insect control programs should start earlier and last longer than they now do. In fact, using insect control as a preventive rather than a corrective measure, insofar as this is possible, may prove to be profitable. Good weed control is necessary for much the same reason. Improved drainage takes on added importance with the use of supplemental irrigation in rain-grown areas. When preparations are made to put water on land, preparations should also be made to get it off the land.

A greatly expanded research program will be necessary to provide guides and serve as a basis for this general "upgrading" of production practices. Not only will it be necessary to provide answers in terms of hydrology and agronomic changes; it will also be necessary to determine how these modifications fit into farming systems and how they affect farm organization and operation.

• **A Broader Look** — Many paradoxes may exist if anything like the potential for supplemental irrigation is realized.

Certainly, in effect, the increased production provided through supplemental irrigation would be a vertical expansion of acreage. Unless suitable market outlets are found for the increased production of cotton, no doubt further cutbacks in acreage would be necessary. In fact, cutbacks could be forced to such an extent that many of the efficiencies accruing to irrigation would be lost because of poor distribution of overhead.

Drastic reductions in acreage because of greatly increased production could also mean a complete reorganization of production patterns and a need for new, or not yet known, alternatives.

On the brighter side, certainly the increased efficiencies growing out of irrigation would lower production costs and strengthen cotton's competitive position so far as price is a factor. And if market outlets could be found, the higher profits and wages resulting would mean improvement in levels of living for those who produce cotton. ◆ ◆

Insects

Changes in Recommended Insecticides

DR. J. C. GAINES, Head, Department of Entomology, Texas A&M College, College Station.

During the last few years several revisions have been made in the insecticides recommended for use on cotton. These changes were caused by the development of new insecticidal compounds and certain species of insects becoming resistant to the chlorinated hydrocarbons.

For many years calcium arsenate was used exclusively for boll weevil control. It was replaced largely by the organic chlorinated hydrocarbons during the past 10 years. During the 1955 season, the boll weevil was reported difficult to control with the chlorinated hydrocarbons in Louisiana. Most of the chlorinated hydrocarbons in common use were involved. At first entomologists attributed this failure to obtain control to adverse weather conditions, poor applications of insecticides, low dosages, etc. By late summer 1955, however, the Louisiana Experiment Station entomologists found that the amount of endrin required to control 50 percent of the resistant weevil culture was approximately 112 times that required for the susceptible culture. Tests with chlorinated hydrocarbons preduced essentially the same results, but calcium arsenate and certain phosphorus compounds gave comparable control to both the resistant and non-resistant strains of weevils. Subsequently, entomologists in Louisiana reported that the resistance to chlorinated hydrocarbon insecticides in the boll weevil was genetically controlled.

Reports indicate that the weevil was difficult to control with chlorinated hydrocarbons during 1957 in certain areas of several other states, including Arkansas, Mississippi, South Carolina, North Carolina and Texas. In these areas where the weevil was resistant to the chlorinated hydrocarbons, control may be obtained with calcium arsenate or a phosphate insecticide. The use of calcium arsenate does not fit into a diversified farming program in many cases and growers prefer to use sprays rather than dusts. Several commercial companies are attempting to develop arsenicals suitable for spraying cotton.

Most of the states in the Cotton Belt include methyl parathion, malathion and Guthion in the list of insecticides recommended for boll weevil control. Entomologists in several states suggest the use of these phosphates only in areas where weevils are difficult to control with chlorinated carbons while others recommend their general use for weevil control. Both malathion and methyl parathion were used generally in the resistant weevil areas last year. Since these compounds have poor residual toxicity, it was necessary for planters to follow a three- to four-day schedule during the migration period.

Mixtures of chlorinated hydrocarbons and phosphate insecticides have been used with good results in many areas where resistant weevils have been reported. Laboratory tests have shown that chlorinated hydrocarbons mixed with phosphates resulted in no better control than phosphates alone. In some field tests the mixtures appeared promising while in others they did not. This could be attributed to the degree in which the weevil was resistant in the various fields. DDT is not considered a good boll weevil killer when used alone, but it is known that when it is added to certain chlorinated hydrocarbons the degree of control is noticeably improved. DDT is also necessary in insecticidal mixtures for the control of the bollworm.

• **New Insecticides**—Two new phosphate insecticides and a carbonate were used in experiments conducted in several states during the past season. They all proved very promising for boll weevil control and possibly will be recommended for general use in 1959, provided, of course, they prove effective in tests again in 1958.

For years entomologists have dreamed of an insecticide which could be used as a seed treatment to control cotton insects. Several years ago this possibility was partially fulfilled. Thimet, used as a seed treatment, was found to be effective in the control of thrips, mites and aphids for a period of four to seven weeks after planting. This insecticide is now recommended for general use in several states. Although Thimet does not constitute a complete solution, it is a good beginning. We all have hopes that a compound will eventually be developed which can be applied as a seed treatment to control overwintered boll weevils as well as thrips, fleahoppers and other pests of young cotton. Thus by reducing the populations of injurious insects early in the season, the potential threat to the crop later in the season will be greatly reduced.

For many years nicotine was relied upon to control aphids, but in general it was not satisfactory for this purpose. When benzene hexachloride was developed it was readily accepted for use on cotton to control boll weevils and aphids. Later the phosphates were found to be excellent aphicides and currently are preferred in most areas for aphid control. In some states benzene hexachloride has been withdrawn from the recommended list of insecticides due to the erratic control obtained by use of this material. Some entomologists suspect that aphids have developed resistance to this chlorinated hydrocarbon.

The general use of chlorinated hydrocarbons has created environments favorable for spider mite population increases in many areas of the Cotton Belt. Sulphur was relied upon as a suppressive measure for a time, but damaging infestations of the two-spotted mite are no longer prevented by this material. Entomologists in most states recommend either parathion, methyl parathion, demeton, malathion or aramite for mite control. In areas where the phosphates are not recommended for mites, sulphur or aramite is relied upon for control of this pest. Several new miticides have been tested this year that appear promising for spider mite control.

In certain areas of the Cotton Belt, planters have had difficulty in controlling Lygus bugs due to their resistance to certain insecticides or to poor applications of insecticides, which were made after the pests had developed to injurious numbers. It is believed that the chlorinated hydrocarbon insecticides now recommended will do the job, but applications should be made before the bugs have developed to damaging numbers.

Some adjustments are being made with regard to spray applications. Results of experiments conducted over a period of several years indicate that nozzle spacing of 20 inches on the boom of ground spraying machines is adequate for the control of the major cotton insect pests.

• **Early Season Control**—Entomologists in nine cotton-growing states, which produce 65 percent of the cotton, recommend the use of insecticides to reduce injurious insect populations early in the season. This procedure reduces populations of insects thus protecting the young fruit, which allows the plants to produce a full bottom crop. The physiology of the cotton plant is such that a high percentage of the squares on the lower half of the plant will produce bolls if protected from insects, while a high percentage of the squares produced on the top half of the plant will shed and fail to produce bolls. The protection of the squares early in the season insures the grower early fruiting along with early maturity and better quality. This alone has been an important factor in cotton production this year. As a consequence of early-season control the planter secures better yields and more profits.

Of great importance is the complete coverage of the field with insecticides. Oftentimes there are power lines or trees which prevent a thorough coverage of the field by planes and those uncovered areas serve as breeding places for insects which continue to breed and migrate throughout the season to adjoining fields. Ground machines should be used to control the breeding in these areas thus reducing the number of applications necessary to maintain control on the entire farm. ◆ ◆

Insects

Promising Leads in Basic Research

C. F. RAINWATER, In Charge, Cotton Insects Section, Entomology Research Division, ARS-USDA, Beltsville, Md.

During the past two years we have experienced a tremendous change in our

thinking concerning the control of cotton insects. We had heard that the cotton leafworm and some of the spider mites had developed resistance. We were somewhat suspicious that the cotton aphid had developed some degree of resistance to BHC. The insecticide industry was rather complacent prior to the 1955 season. But when it was announced that the boll weevil had developed resistance to the chlorinated hydrocarbon insecticides, we all woke up. This was something of vital concern to the cotton farmers in the South and to the cotton industry as a whole. It was a direct challenge to the cotton entomologists, for both the cotton farmer and the insecticide industry turned to them for guidance.

• **Basic Research**—From basic research we knew that in the case of resistance in other insects a change in insecticides would at least be temporarily helpful. Basic research had shown that certain combinations of insecticides were more effective than the same materials used alone. These facts were put to use, not only in the known resistant areas but pretty well throughout the boll weevil belt. Any insecticide salesman can vouch for the fact that there was no predicting what the farmer would use in the way of insecticides during the last two years. He has used just about everything in the book, and no area has followed a consistent pattern of insecticide usage. What is the result? The problem isn't solved. But it's not at the moment as great a problem as it appeared to be by this date in 1955.

• **Boll Weevil Resistance**—If insecticide usage, as such, would bring on boll weevil resistance, then the area that had received the most insecticides over the longest period should have been the first to develop resistance. But this didn't happen. In no area have more insecticides been used over a longer period than in the Brazos River bottom in Burleson County, Texas. They don't have a boll weevil resistance problem there. Why? Probably because they have not consistently used any one insecticide or any group of insecticides. Contrast this with the Delta area of Mississippi, where dieldrin and aldrin were the principal insecticides for several years prior to 1956. Laboratory tests conducted at Stoneville, Miss., show that it is almost impossible to kill weevils from that area with any dosage of dieldrin.

With these facts before us, what should be the cotton entomologists' approach to a cotton-insect research program? Should we concentrate our efforts on trying to find more powerful insecticides? We've been very successful in developing new insecticides. We think that by next year we will be able to recommend one belonging to a class of chemicals entirely different from any of the insecticides in common usage today —a direct result of basic research.

Should we concentrate on developing combinations of two or more insecticides? We have known for a long time that a 2:1 spray mixture of toxaphene and DDT is a better cotton insecticide in the boll weevil area than either material alone. But it took basic research to tell us why. The answer was that DDT is an excellent boll weevil poison once it gets inside the body but when used alone it is not effective. When combined with toxaphene in spray, both insecticides are effective and their combined action results in a high boll weevil mortality. Other combinations might be discovered which would be equally or more effective.

THE SECOND SESSION Friday morning included discussions on research work with the boll weevil and hurdles in developing agricultural chemicals. Participants included (l to r) C. F. Rainwater, in charge, Cotton Insects Section, Entomology Research Division, ARS-USDA, Beltsville, Md.; Dr. John A. Ewing, presiding officer; J. V. Vernon, president, National Agricultural Chemicals Association and president, Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N.Y.; and Dr. H. G. Johnston, Production and Marketing Division, National Cotton Council, Memphis.

• **Research Approaches** — I expect some of us have been a little biased in our research approach to cotton-insect control, particularly as it relates to the boll weevil. In order to test an insecticide thoroughly, we seek locations with high populations. This is standard test procedure. We purposely wait until the infestation reaches a high level—often from 25 to 70 percent—and then apply the test insecticide under carefully controlled conditions. By showing that high infestations can be controlled we imply that it is not necessary to do anything until the population reaches a certain level. In some years that level won't be reached, and so the insecticide applications are saved.

Now let's take another approach. This approach is designed to keep the population level below a point of severe injury until the crop is made. In much of the Cotton South boll weevil damage is liable but not certain to occur every year. The damage caused to cotton in the seedling and early fruiting stages is often light, but occasionally it is severe. When the damage is severe, no one would question the advisability of applying control measures. It is when damage is light in the seedling or early fruiting stage that the contingent control program is in question.

A great many experiments have shown that poison applications made in the pre-fruiting stage have resulted in earlier fruiting and setting of a bottom crop than applications not made until after the infestation has reached a predetermined level. Now is this earlier fruiting and the setting of a bottom crop desirable or not? Under ideal conditions, maybe not. The cotton plant is remarkable in its ability to recover from shock and, if given time, to produce all the fruit it is capable of producing, if conditions are just right. But how often are conditions just right? How much cotton was lost this year because of an early freeze? How many times has drouth resulted in nothing except a bottom crop? How many time have late-season rains interrupted the poison-application schedule so that heavy, and costly, applications must be made every two or three days? Under these and many other conditions that could be mentioned, the early-set bottom crop really paid off. But this was not the only payoff. The middle crop and that portion of the top crop which matured was made at less expense than where applications were not made in the pre-fruiting stage.

• **Boll Weevil Reproductive**—In the boll weevil belt there are always enough weevils that survive the winter to build up to damaging populations some time during the season, except under extremely unfavorable conditions. The rapidity with which they build up depends on two things—the number that survive and the rate at which they increase. The rate of increase may be determined by natural-control factors, such as hot, dry weather during the first and second generations, by artificial-control factors, such as the early-season application of insecticides, or a combination of both. Basic research has taught us a lot about the boll weevil and the factors which influence its survival and multiplication. Nature has seen to it that most survivors emerge into the fields at such time that they can lay their eggs in squares and thereby start a new generation. True, there may be many weevils in the field before squares are large enough for oviposition and some of them may die naturally before they get a chance to lay eggs, but there will always be enough there when squares are at the correct stage of growth to assure a new generation.

Let's assume that a normal population survives the winter and that conditions are favorable for the development of the first generation, as happened in much of the boll weevil area this year. Which was the better program to follow, one based on contingent control or one based on deferring treatments until a predetermined level of infestation was reached? If every female boll weevil laid 200 eggs, about the average of which she is capable and if each of these eggs produced another boll weevil, and if half of these were females and each laid 200 eggs all of which reached the adult stage, and if this sequence were repeated only through

the third generation, there would be 2,020,000 adult boll weevils. We know that the population does not increase at this rate. Let's assume a tenfold increase per female per generation, which would probably not be too far off under average conditions, and see what would happen.

We usually refer to spring populations in cotton fields as so many weevils per acre. If we have 50 weevils per acre in the over-wintering population, half of these, or 25, would be females. Using our tenfold increase factor, the first generation would consist of 250 per acre. The second generation would consist of 1250 per acre and the third generation would be 6250. Most of the first and second generations would still be living, and the population by then would be in excess of 7500 per acre. At the end of the fourth generation between 35,000 and 40,000 weevils per acre would be present and the population would be so great that even if 75 percent were killed by an insecticide application, which incidentally would be a much higher percentage than usual at that time of year, it would be almost impossible to prevent tremendous damage.

• **Early Season Control**—Now let's suppose that we have practiced a contingent control program and that it was 80 percent effective in reducing the overwintering population. Instead of having a population of 50 per acre to infest the first squares, we would have only 10. Using the same increase factor, we would have 7800 at the end of the fourth generation. In other words, a reduction of only 80 percent in the overwintering population before they could deposit eggs would be equivalent to a delay in the time for one full generation to develop before the population reached a damaging level, whether this occurred at the end of the second or succeeding generations. Ordinarily this would delay the need for applying insecticides for 15 to 20 days and would result in the saving of three to five applications. Now which is better, to put two or three applications on in the pre-fruiting stage of growth or three to five additional ones later? In either case there may be need for late applications.

Let's remember also that our theorizing was based on only an 80 percent reduction in the overwintering population. I believe I am safe in saying that, in most of the experiments where population counts were made following pre-fruiting applications, the reduction was greater than this, and in many it was 100 percent. Often the population never builds up to a damaging level within a given field, but reaches that level by migrating weevils from the surrounding area. This points to another and equally important factor—that of widespread participation by the farmers in any given area in whatever program seems most desirable.

• **New Knowledge** — We've recently learned how to rear the boll weevil on a semi-synthetic diet in the laboratory, for example. This offers tremendous opportunities for productive research in developing new insecticides, attractants, and repellents; in developing resistant varieties of cotton; in utilizing chemicals that are antagonistic to growth, development, and fertility of the boll weevil; and in the development of new methods and new concepts of control. We've recently discovered that, contrary to what has been generally assumed, DDT is very effective against the boll weevil once it gets inside the body. It does not readily penetrate, but we are learning how to overcome this.

We're studying factors concerned with the reversion of a resistant strain of weevils to a susceptible strain, and we have leads in this direction which may prove to be of great practical significance. We have some evidence of chemically inducing the cotton plant's resistance to insect attack which is an entirely new concept of insect control. The possibilities that could result from this are far-reaching. We are well along in the development of a new insecticide, belonging to a class of chemicals different from any in widespread use today, which bids fair to becoming effective against many of our cotton insects, and we are experimenting with others in the laboratory which also show much promise. We are uncovering new facts about systemic insecticides which may prove valuable in their further utilization.

We're learning much about diapause in the boll weevil, which explains a great many things about late-season populations, hibernation, and emergence that may have practical value in a control program. We're studying population dynamics from the standpoint of determining at what level it is most economical to begin applying insecticides. We're tearing the boll weevil apart and studying its physiology and biochemistry in an effort to find out what goes on inside, in the hope that we may discover a new lead as to its control. We're learning a great deal about its nutritional requirements, which may be of immense value in developing a plant or feeding something into a plant which will not supply the nutrients in the quantity needed for growth, development, or reproduction of the insect.

We've recently found some disease organisms that are highly effective against several cotton pests under laboratory conditions and are experimenting with them under more practical conditions. We've recently found that the extrafloral nectaries are an important food source for the pink bollworm moth —that the female does not lay nearly as many eggs when this food source is lacking. This might also be true of the bollworm and other moths, and points to the possibility of breeding a variety of cotton void of extrafloral nectaries. We're studying the relationship of chemical structure to insecticidal action as a basis for suggesting the synthesis of new compounds.

We are very optimistic over the future of cotton-insect control. We have the resistance problem with us, and we have no reason to think that additional insect pests won't come into this category sooner or later, but with our research scientists working on these problems and with our barrel still not empty we'll keep ahead. ◆ ◆

Insects

Cultural Practices for Weevil Control

DR. H. G. JOHNSTON, National Cotton Council, Memphis.

Some cotton insects, particularly the boll weevil and bollworm, are more readily attracted to vigorous, succulent, rapidly-fruiting cotton plants than to less thrifty plants. Improved production practices have not only stimulated plant growth and rapid fruiting, but have extended the growing period into late season. For the boll weevil, at least, this means a potential heavy population during the peak fruiting period and an extended population build-up until frost. But what does the extended population build-up in late season mean? It means a tremendous increase in the number of weevils entering hibernation in the fall —and thus potential increase in the number emerging from hibernation in the spring.

There is ample evidence to show that the boll weevil population potential has increased tremendously during recent years. The USDA Cotton Laboratory at Tallulah, La., has consecutive records of fall and spring woods trash examinations for Madison Parish starting in 1936.

There has been an 85 percent increase for the last 10-year period (1946-55) in the average number of live weevils in the fall—but there has been an even greater increase of 147 percent in the number of live weevils in the spring. This simply means that there were, on the average, about two and one-half times as many live weevils in the spring during the last 10-year period as in the previous 10 years. There is good reason to believe that similar increases have developed also in other areas.

Obviously, part of that increase is due to more weevils going into hibernation in the fall—but part of it is also due to a greater percentage of fall weevils surviving the winter. An average of 29 percent of the weevils survived the winter during the first period (1936-45) and 39 percent for the latter period.

Why have we had such a tremendous increase in the number of live weevils in the spring? It may be simply that the boll weevil is becoming adapted to climatic conditions in the Mississippi Valley. But—in my opinion—the most important factor is changing cotton production practices that make conditions more favorable for boll weevil development and winter survival.

The increased use of fertilizer and irrigation has extended the growth and fruiting period of cotton in the fall. In general, this furnishes an abundant food supply for boll weevils until frost. This not only means a tremendous increase in the number of weevils going into hibernation—but, it also means that they are well fed, fat, vigorous, and in better condition to survive the winter. On this basis, we may expect even larger overwintering populations in the future.

• **Chemical Control**—There is no doubt that chemical control will continue to be a major factor in cotton insect control. But because of the situation that has developed during recent years, I am firmly convinced that we must make a determined effort to develop a boll weevil control program that is not dependent upon chemicals alone.

This is not a new idea. Leading entomologists for many years have urged the use of cultural practices as an essential part of an effective control program.

The phenomenal success of chemical control has caused us completely to lose sight of one of the most elemental—the most fundamental principles of boll wee-

vil control. That is, the reduction of the over-wintered population, by any practical means, before they have laid eggs for the first generation early the next summer.

• **Early Stalk Destruction** — There are only a few modern examples of the effectiveness of early stalk destruction for boll weevil control. The most outstanding one is in the Lower Rio Grande Valley of Texas, where the cotton growers have no choice but early stalk destruction because of the pink bollworm. The program has also been highly effective for boll weevil control.

For many years the Valley has had regulated planting dates and compulsory stalk destruction by Aug. 31. Since 1944 boll weevil records throughout each season have shown a direct correlation with the thoroughness of stalk destruction the previous year. Only in three years during the past 14 have boll weevils been a real problem. Each of those can be attributed to a poor stalk destruction program the previous year. And, there is probably no area in the U. S. where conditions are more favorable for boll weevil development than the Lower Rio Grande Valley.

The effectiveness of early stalk destruction for boll weevil control in the Valley was widely recognized, but there was considerable doubt whether the program could be developed even in Central Texas because of a shorter growing season—average frost date about Nov. 15. However, in Williamson County an extensive educational campaign was conducted by the Extensive Service for early stalk destruction in the fall of 1947. A rather high percentage of stalks were destroyed by Oct. 1, and 90 percent or more by Oct. 5.

The following year (1948) boll weevil infestation records were made throughout the season in Williamson and four adjoining counties for comparison. The over-winter population of weevils in the four adjoining counties was relatively high in the spring of 1948. The percentage of square infestation dropped rapidly until the first generation emerged about July 1. Then, in general, it increased rather rapidly for the remainder of the season. The primary importance of the records in these four counties is to show that there were boll weevils in the area throughout the season.

The important information is the record for Williamson County. The weevil population was very low when cotton began to square about June 1 and remained low throughout the season. The most significant thing is that the infestation was so low that the first generation emerging early in July had but little effect upon the square infestation, and not until the second generation emerged in late July was there any significant increase. Even then, the average infestation did not reach 20 percent.

This program has been continued in Williamson County and most of Central Texas. Because of pink bollworms this area now has mandatory regulations for stalk destruction by Dec. 1, but most growers destroy stalks voluntarily as early as possible to obtain effective boll weevil reduction as well.

Simply because this program has proven to be highly effective in Central Texas does not necessarily mean that it can be used with equal effectiveness in the Midsouth or Southeast. Certainly, it could not have been used this year. It does offer sufficient promise, however, that a determined effort should be made to develop such a program wherever possible.

Early stalk destruction does not necessarily mean mechanical destruction of the plants. Precisely, it means the elimination of the boll weevil's food supply—in general, the elimination of regrowth that is good for nothing but to produce and fatten untold millions of weevils to attack next year's cotton crop.

• **New Machines** — There are perhaps many reasons why early stalk destruction has not become a general practice long ago. But the major factor may be that we have not had suitable tools to do the job. But with the rapid development of mechanization and agricultural chemicals, adequate tools are now available.

Stalk shredders are now available that will do a rapid and economical job. When weather conditions permit an early harvest, this is by far the best way to get the job done. But weather conditions often delay harvest or otherwise interfere with mechanical shredding at a time when most effective boll weevil reduction might be obtained. But under such conditions defoliation or desiccation —or both—might be used to eliminate the weevil's food supply. In fact, it is just seasons as this when defoliation is needed most as an aid for harvesting.

• **Defoliation** — Comparatively little research has been done on the effects of defoliation on late season development of boll weevils. However, numerous observations and some planned experiments were conducted at Stoneville, Miss., from 1942 to 1950.

The results were most promising since complete defoliation removes all squares, blooms and small bolls, as well as the leaves. By the time defoliation was complete, practically all weevils had left the fields and had gone to nearby undefoliated fields. Therefore, to be effective this practice must be used over a large area. Damage to immature bolls was practically eliminated.

In 1945, boll weevil records were made on seedling cotton in fields that had been defoliated the previous fall. No weevils were found in 12 such fields. In 12 adjacent fields that had not been defoliated the previous fall, six were infested with an average of 116 weevils per acre.

Plant regrowth following defoliation is an important factor in the harvesting process as well as for boll weevil reduction. In some of these tests, up to 50 percent of the plants produced regrowth and 12 percent produced squares. However, no weevils developed beyond about one-third grown on plants defoliated as early as Aug. 23. Thus defoliation, regardless of regrowth, will effectively prevent the development of millions of weevils that otherwise might be around to attack next year's crop. But regrowth will furnish a food supply for those weevils already developed and better enable them to survive the winter.

Of course, we are still hoping to find a defoliant that will prevent regrowth and do a complete job both for harvesting and reducing the boll weevil population. But until such a defolant is available, the use of a desiccant following defoliation, when conditions are favorable for regrowth, might pay big dividends for boll weevil control.

It is absurd—even if we had no resistance to insecticides—to continue to allow the uninhibited development of millions of weevils in the fall and expect to get the most economical control with chemicals the following season. The early elimination of the weevil's food supply is an important factor. And that means only one thing — eliminating growing cotton plants as early as possible in the fall.

I would not propose that this is the only way that this problem can be approached. Perhaps this is not the most practical approach. But I am proposing that we are confronted with a changing situation—a situation that has already greatly intensified the boll weevil control problem—a situation that demands a complete re-evaluation of our total boll weevil control program. ◆ ◆

Perplexing Hurdles In Developing Chemicals

J. V. VERNON, President, Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N.Y.

Risk capital is entitled to a decent return. If this were not true, then there would be no risk capital and business in this country would stagnate. It is generally accepted that a new pesticide product developed in the laboratories of our industry, from inception to readiness for use, costs around $1 million. Some cost more, some less, but here again we have risk capital. The product, if it is good for agricultural purposes, has a chance to succeed and you can hope to recover the research dollars spent provided its life usefulness is long enough to permit its manufacture and sale in sufficient quantities and at good enough profit return.

To staff the research departments of our industry requires the selection of scientifically trained personnel. They must be people who are interested in their work and who are willing to play on the research team, gaining recognition for their contribution to usefulness in agriculture. It is estimated that our industry spends $15 million annually for research, and that our federal government spends another $5 million on related research problems. In addition, various states also are spending substantial sums.

Another aspect is the development of toxicity data on which residual tolerances may be established so that safe uses of pesticides may be prescribed and directed. This is expensive and time-consuming

Another aspect is legislation, both federal and state. At this point I would like to point out what I consider is a very important attitude of the pesticide industry and the National Agricultural Chemicals Association which I represent. We have a record of supporting sound legislation, as evidenced by our support of the Federal Insecticide Fungicide, and Rodenticide Act of 1947, and the model state laws as recommended by the Council of State Governments and the Association of Commissioners, Directors and Secretaries of Agriculture. We also supported the Miller Amendment to the Food, Drug and Cosmetic Act, which covered the use of pesticides on raw agricultural commodities.

However, I would like to state that we vigorously oppose restrictive legislation

which would increase costs to, or would be injurious to those we serve—the farmers who are our end-use customers.

It has been our pleasure to work with the Association of American Pesticide Control Officials, and we believe that through our mutual efforts substantial progress has been made in developing sound legislation and regulations.

It is our belief that the land grant colleges, state enforcement officials, distributors, dealers who recommend and market our products, and we, as an association representing the manufacturers, have a responsibility to make available effective and safe pesticide products for the protection of farm crops and the public health at prices consistent with quality, research, technical developments, and economics of crop production.

• **Adverse Publicity** — I think that all of us in the pesticide industry, land-grant college personnel and state enforcement people have a job of the first magnitude to counteract adverse publicity. The important part of our story is to point out that food and fiber crops, or meat and dairy products cannot be economically produced without the use of pesticides which have been proved to be safe. This fact is not recognized by the majority of our city and urban population.

An example of extreme adverse publicity is illustrated by the wave of criticism against the gypsy moth spraying program in the Northeast. Resistance by organic farmers and other misinformed persons to the aerial spraying project that was conducted jointly by USDA and the states reached a climax when court action was initiated to obtain an injunction to halt the spraying program. All present and future control programs could be jeopardized if the case should go against the USDA. It also could affect some realatively new programs being planned against the fire ant, nematodes and witch weed.

• **Tolerances**—Some states are adopting federal tolerances by regulation under the State Food and Drug Laws. We believe that this is a sound move where state tolerances are deemed necessary. Failure to have a uniform pattern of tolerances would create confusion both on the part of the producer and the user of farm products, and we urge the adoption of uniform procedures that follow federal tolerances which have been established after long hours of work and great expenditures of tax money and industry funds.

There has been much talk recently about resistance. That there is resistance has been scientifically proved in some instances. However, we feel that the resistance problem is being magnified and publicized out of all proportion, and that it now offers a hideaway for any failure in pest control due to poor application, poor timing, poor choice of material, etc. While the problem of resistance should not be minimized, nevertheless it should not be exaggerated. A study of its economic importance is needed.

There has been a degree of confusion towards special label requirements on a state basis. We are opposed to this requirement. Special labeling increases the cost to pesticide consumers, since the expenses of compliance with these requirements is usually passed on to the user of these products.

Many important crops require emergency measures of protection, and it is a common practice in the industry to move large quantities of materials from one state to another when serious infestations of boll weevil, grasshoppers, army worms or other pests develop. Special labeling restrictions would make it impossible to legally meet the demand for pesticides in these instances. This means delay in deliveries, short supplies, bootlegging, and possible loss of crop.

• **Standardization and Simplification** — Standardization essentially means a setting of certain specifications in an effort to assure the quality of a product. Simplification is the elimination of some products from the market place, with sales restricted to certain specified products or formulations. When we say that a product must meet certain minimum and maximum specifications on the various components thereof—this is standardization. When we say that *only* products containing 10, 25 or 75 percent of certain ingredients can be sold or used—this is simplification.

Attempts have been made to force simplification on the Pesticide Industry. We have opposed and are opposed to this when done by legislation or regulation. There is an established voluntary and legal procedure for achieving this, if desirable. It is provided for in the so-called "Simplification Program" of the U.S. Department of Commerce.

The Pesticide Industry has a record of supporting sound control legislation. Our industry assumes the burden and costs of most of the research, registration and other costs due to regulations to assure that the farmer gets a good product.

Present legislation is fully adequate to keep off the market inferior products which will not effectively control the pests for which they are recommended and sold. Simplification is not necessary to insure that the grower receives a good product at a fair price.

Enforced simplification would interfere with the rights of the manufacture to sell and the rights of the buyer to select a product he wishes from a number of effective materials. This would be equivalent to prohibiting a person from buying a Cadillac because some official has decided that a Ford is better for him.

We recognize that there are valid reasons for one state recommending a certain product while another does not. However, we do object to regulatory proposals which would arbitrarily limit the number and kind of formulations which could be sold and used for a specific pest control program.

It is not sound to give to any government official the right to arbitrarily refuse registration of any effective and proper labeled product. To do so will lead to a situation where the sale of pesticides would depend on the opinions, prejudices, honesty and subjective judgment of some individual. Many effective chemicals and formulations will ultimately be barred from the market if pesticides are so restricted. The farmer would suffer since manufacturers could not afford the expense and would not undertake research necessary to develop new products if their ultimate use depended on the arbitrary decisions of one or two individuals.

There is another ramification to the matter of simplification which also must be considered. If government takes over the function of specifying what pesticides the farmer can use it must also assume the responsibiiity for any failure of specified materials to control pests, and must assume responsibility for violations of any statutes, such as the Miller Amendment to the Food, Drug, and Cosmetic Act.

We recognize that there has been standardization and simplifying fertilizer formulations where there are only three principal ingredients, nitrogen, phosphorus and potash, as compared to pesticide formulations which may be compounded from any number of some 200 active ingredients.

I have attempted to bring out some of the issues which we are facing and are going to have to face. I feel that it is possible to arrive at sound conclusions on these and other problems the same as we usually have in the past through cooperation with the various federal and state agencies with whom we work and with agencies such as yours. ◆ ◆

Weed Control

Weed Control In a Wet Year

DR. WALTER K. PORTER, JR., Pathologist, and C. H. THOMAS, Agricultural Engineer, Louisiana Experiment Station, Baton Rouge.

Efficient and ecconomical weed control in cotton is important in any year, and especially during a wet year when more weeds are present. The conventional method of complete hand removal of weeds, while fairly efficient and economical during dry years, becomes inefficient and uneconomical during wet years. Another factor which may be considered in any discussion on weed control in cotton is the effect of weeds on the final yield and quality of the crop.

• **Reducing Hoe Costs**—The use of the pre-emergence herbicides is now becoming an established practice in cotton culture. In a 1957 statewide survey, farmers estimated an average of $9 per acre was saved as a result of pre-emergence herbicides.

Experiments in Louisiana since 1953 have shown that hoe labor can be reduced from an average of about 42 hours per acre when standard cultural practices are used to about 11 hours per acre when pre-emergence herbicides are used. This reduction in hand labor saves about $8 per acre, after considering the costs of chemicals and applications. Data from seven experiments conducted during 1957—a wet season—showed that the average hand labor required was 68 hours for conventional cultivation-hoeing, whereas only 7.4 hours of hoeing were required where a pre-emergence herbicide was used. These data showed that the conventional hoe time requirement was about 26 hours above average, whereas the hoe time required for chemically treated plots was about four hours less than average. These figures indicated that the herbicide not only greatly reduced the hand labor requirement on the average but also was actually more efficient during a wet season.

Obviously, use of a pre-emergence herbicide will yield good returns in a wet

season, but will it pay year in and year out? This question can be answered by reporting that pre-emergence herbicides yielded good net returns four out of the past six years. The years 1953 and 1955 were extremely dry and as a result net losses of 46 cents for the former year and $4 for the latter year were obtained.

The reason for a slight net loss during dry years is obvious. If there were only a few weeds present and it were necessary to do some hoeing, the hoe time differential between treated and untreated plots would be small. At the same time, it should be remembered that the maximum loss that could be obtained under dry conditions would be equal to that of the cost of herbicide plus the application cost, whereas the gain that could be obtained on wet years is unlimited.

Most Experiment Stations, as well as the manufacturers of pre-emergence herbicides for cotton, recommend that the herbicides be applied to a 12 to 14 inch band centered on the drill. During the last two years, a number of farmers have reduced this band width, in some cases, to as narrow as six inches. Their reason for reducing width was to save on the amount of chemical used. Experimental information collected in 1957 suggested that such small savings—especially on a wet year—were, in reality, very false economy. For example, the amount of hoe time required for 6, 8, 10, 12 and 14 inch bands was 24.5, 18.7, 9.5, 5.0 and 5.0 hours per acre, respectively. When these hoe time differences were put into dollar valuations, a farmer saved about $0.71 per acre on the cost of chemical by reducing the band width from 14 inches to eight inches, whereas his hoeing costs were increased by nearly $4 per acre. In general, any savings in chemical costs obtained by reducing the band width below 12 inches were accompanied by increased hoeing costs from two to five times the amount saved.

• **Yield Reduction by Weeds** — One point very rarely considered in cotton culture is the effect of weeds on yield. It has long been known that weeds must be removed if the crop is to produce satisfactorily. Ordinarily, weeds are concarried out was, in large part, depentrolled by "dirting" and "hoeing" and the time when these operations could be dent upon the weather. If it was too wet for hand labor or equipment to get into the field, weed control had to wait.

Experiments at Baton Rouge this year showed that delayed "weeding" definitely had an effect upon the yield during a wet year. In a field heavily infested with both crabgrass and pigweed, yields were not reduced by allowing the weeds to reach a height of two to three inches before removal. However, when the weeds were allowed to grow to heights of four inches or more before removal, the yields were reduced from 20 to 50 percent. This was true even though the fields were kept perfectly clean from that stage until harvest.

In another experiment, where one or two weeds were allowed to remain in each hill of cotton, yields were some 20 percent less than when the fields were kept free of weeds. In the same experiment a chemically-treated plot yielded some 10 percent above the standard hoe method. These data, while limited, suggest that weeds play a very striking part in reducing yields of cotton under some conditions.

Another 1957 experiment strongly points out the general economics of good weed control, both in terms of a reduction in hoe labor as well as an increase in yield. In this case, a chemically treated plot required only 7.7 hours of hoe labor and a final yield of 1,765 pounds of cotton was obtained. The comparable non-chemically treated but hoed plot required 79 hours of hoe labor and yielded only 1,500 pounds of cotton. When the total effects of reduced hand labor, after considering cost of chemical and application, were calculated, net saving was some $22.36 per acre. Similarly, chemically-treated plots yielded 265 pounds more seed cotton and, if the cotton was valued at 10 cents per pound, a net gain of $26.50 was realized. A combination of the saving and gain in values showed that the chemical program actually resulted in a $48.86 per acre return.

It should be remembered that the chemical gave an excellent job of weed control, whereas the weather conditions were so adverse that hand hoeing had to be delayed on the non-chemically treated areas. Thus, these figures very strongly point out the "insurance" value of a chemical program. There is no suggestion in this discussion that the chemicals used caused an actual increased yields; however, they did practically eliminate weed competition at a very critical time in the growth of the cotton plants, and the yield increase was a result.

• **Value of Post-Emergence Oils** — Under moderate weather conditions, post-emergence oil can be used as a satisfactory tool for reducing hand labor in cotton production. The statewide survey mentioned earlier showed an average estimate of some $4 per acre savings through use of post-emergence oils.

At Baton Rouge this year, plots treated with oil required slightly but not significantly less hoe labor than untreated plots. This was true regardless of whether the oil was used alone or following a pre-emergence herbicide. Again, as was the case of the timing of the hand hoeing operation, it was not possible to get oiling equipment into the field at the time to obtain satisfactory weed control.

• **Early-Season Flaming** — Early flaming alone, or following a herbicidal oil program, did not reduce hand labor in our Baton Rouge experiments this year. However, flaming did result in a slight (four to six hours per acre) reduction in hand labor following pre-emergence herbicides. The main reason for the effectiveness of flame in the latter case was that the number of weeds was small and the weeds were stunted. As was true in the case of timing of post applications of oil, the timing of the flaming operation was limited by the weather. The value of late season flaming was not determined.

• **Miscellaneous Practices Evaluated** — Pre-planting treatments for the control of Johnsongrass in cotton fields appeared very promising at the earlier portion of the season. Better than 90 percent control was obtained without any injury to cotton in fields that were very heavily infested with Johnsongrass; however, it was not possible to prevent re-infestation of these areas by those plants not controlled. Wet weather prevented hand removal or cultivation of the remaining plants with the final result being no over-all reduction of the Johnsongrass stand in 1957.

• **Conclusions** — Wet conditions in 1957 resulted in severe weed problems. In Louisiana pre-emergence herbicides, when applied according to the Louisiana recommendation, gave excellent weed control and thus significantly reduced the amount of hand labor required for "weeding." In experimental studies, these herbicides reduced labor and also prevented yield reductions due to weed competition. It appears that the use of pre-emergence herbicides will continue to enlarge in the Southern U.S. ◆ ◆

Weed Control

Looking Ahead at Chemical Control

ROBERT WILSON, cotton producer, Arlington, Tenn.

Our operation is built around a cotton allotment of approximately 245 acres, followed by our feed and small grain crops: 125 acres of corn, 200 acres of grain sorghum, 75 acres of oats. Our livestock consists of 150 head of Hereford brood cows and 10 brood sows.

My first experience with chemical weed control was in 1956. We tried it on our day crop cotton with very satisfactory results. The product used was Karmex DL. Karmex was applied to the row in a 14-inch band with an insecticide sprayer following the planter. Several reasons for applying Karmex in a separate operation are: (1) It slows down planting; (2) Planting operation and applying Karmex both need close supervision; and (3) I have the insecticide sprayer that I adapt to apply Karmex.

The product was applied as nearly as possible to the manufacturer's recommendations. We have several different characters of soils. Part of the cotton is on white buckshot soil, very low in organic matter or humus. Another portion is on thin clay soil also low in humus, another portion on a heavier type soil low in humus. Humus is mentioned especially because there is a very definite relation between the amount of humus in the soil and the danger of seedling damage by the chemical. The more humus, the less damage.

• **1956 Crop Year** — The 1956 year was very dry and we had no serious weed problem where there was no chemical used. However, where the Karmex DL was used, the grass and weeds were generally under better control except for Johnsongrass, pigweed, cockleburr, morning glory and cowitch vine. To insure better results from the Karmex, I tried to cultivate only the middle of the row, making sure not to get any of the dirt on the band where the chemical was applied. I continued this type cultivation until the cotton was beginning to shade the drill.

Hoe labor was required to thin the cotton to the desired stand and get the aforementioned weeds. The cost for this was $6.70 per acre plus $2.50 per acre for the chemical applied. Total weed control cost was $9.20 per acre, exclusive of cultivation.

• **1957 Crop Year** — This 1957 crop

year has been the wettest that I have experienced. I used the same practice this year as in 1956, except I hill-dropped my cotton. I used the Karmex at the same rate of application and same width band with somewhat different results. On the thinnest type soil with no humus, the excess moisture carried the chemical down into the root system and produced considerable discoloration of and damage to the cotyledon leaves and retarded the plant growth. On approximately 30 acres, I lost the complete stand. I tell you this with no criticism of the product used. It must be used with caution.

The chemical gave me good control for at least six to eight weeks even with several torrential rains. The cotton was chopped in order to get the Johnsongrass, cockleburrs, and pigweed which the Karmex does not control. My average cost of hoe labor for the 1957 crop was $7.96 plus $2.50 for the chemical applied, making a total cost of $10.46, exclusive of cultivation.

• **1955 Crop Year** — In 1955 we had an unusually dry year and a bumper crop year. My planting and cultivation operation had followed the same general practices each year. This year I did not use any chemical weed controls and no hill-dropping. The cost for hoe labor for 1955 crop year was $6.45 per acre.

• **Review and Comparison**—Now we have three years that we can review and compare. The 1955 crop year was dry enough that small seed close to the top of the seedbed did not germinate and grow as fast as the cotton seedlings. Therefore, this is the main factor along with regular cultivation which held my hoe labor to $6.45 per acre.

The 1956 chopping cost of $6.70 per acre plus $2.50 for chemical or a total of $9.20 per acre is what I would consider to be a production cost that has been reduced about 45 percent in a normal crop year.

The 1957 chopping cost of $7.96 per acre plus $2.50 for chemical or a total of $10.46 per acre for weed control in the wettest crop year that I have experienced has sold me on the use of chemicals to help control weeds. I recall in years past when June was a wet month, it cost $20 to $25 per acre to clean the crabgrass and weeds out of the cotton.

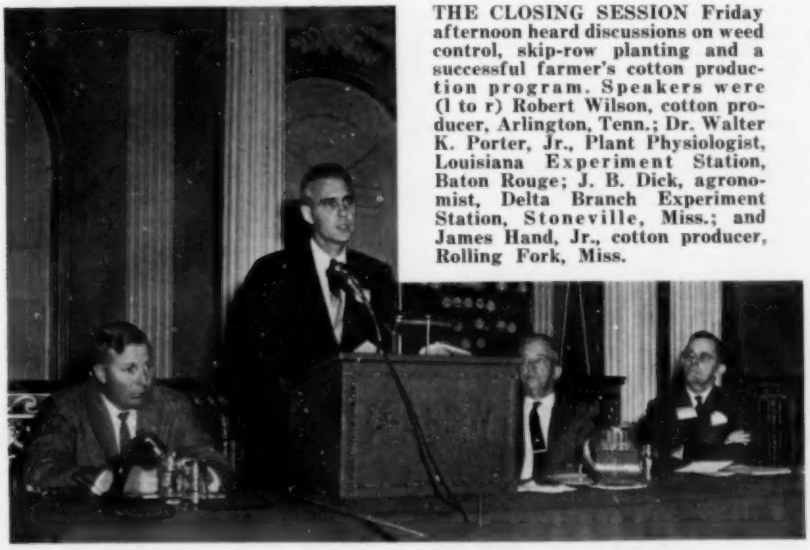
Several factors enter into the use of chemical weed control. Let me mention some of the advantages and some of the disadvantages of chemical weed control. First the advantages: (1.) Reduces hoe labor which reduces cost of production; (2.) It is a type of insurance against loss of crop and fertilizer caused by grass and weeds when heavy application of fertilizer is used and there is abnormal rainfall; (3.) By weed control in your cotton, you are able to give attention to the planting of other crops that round out your farming program; (4.) There is no costly equipment required for the application. Only spray nozzle tips have to be changed and sprayer properly calibrated to adapt an insecticide sprayer for Karmex application; (5.) There is no special seedbed preparation required. Apply directly to seedbed after planting; and (6.) The crop is not retarded by smothering grasses and weeds.

What are some disadvantages?

(1.) The most serious disadvantage that I know of is the tolerance or margin of error factor regarding the amount of chemical applied; (2.) In case of over-application, replanting is delayed from 10 to 14 days; (3.) An over-application retards early growth of plant; and (4.) Possible soil injury from continued use.

• **New Labor Supply** — The supply of cheap labor which is required for the profitable production of cotton is gradually diminishing on the cotton farm of the South, and weed control whether by chemical, mechanical or flame control must take over. In my own operation since I have used chemical weed control, my chopping cost has been reduced and I have not had to transport labor from Farm Labor Offices or nearby communities. The tenant labor that has been on the farm for the last two years has been able to handle my chopping satisfactorily. If and when in the future, the increased wages become prohibitive on the cotton farm, the chemical or flame weed control cost will have to be held to a minimum.

There is no question about the continued development of chemicals for weed control, but the margin of error factor in the application will have to be broadened. A better educational program for farmers should be provided if the tolerance or margin of error factor is not broadened. Also an economical product that will control the crabgrass, nutgrass, Johnsongrass, cockleburr, morning glory and pigweed in a single application and not damage the seedling plants must be developed. Until this is accomplished, there will be a necessity for a small amount of hoe labor on the cotton farm. The item that contributes to the high cost of production is the hand labor. This is mostly used in hoeing and picking. If the hand labor is reduced, then cotton will be able to compete successfully with the synthetic fibers. ◆ ◆



THE CLOSING SESSION Friday afternoon heard discussions on weed control, skip-row planting and a successful farmer's cotton production program. Speakers were (l to r) Robert Wilson, cotton producer, Arlington, Tenn.; Dr. Walter K. Porter, Jr., Plant Physiologist, Louisiana Experiment Station, Baton Rouge; J. B. Dick, agronomist, Delta Branch Experiment Station, Stoneville, Miss.; and James Hand, Jr., cotton producer, Rolling Fork, Miss.

Planting

Skip-Row Planting In the Rain Belt

JAMES B. DICK, Agronomist, USDA-Delta Branch Station, Stoneville, Miss.

One of the newest practices being tried for increasing yields is that of planting one or more rows of cotton and leaving one or more blank or fallow rows between the planted rows. Everyone who has grown cotton has noticed the greater yield of the outside rows and end stalks. This skip-row planting of cotton is an effort to cash in on the border row effect by having every row a "border row."

A number of combinations of planted and skipped rows have recently been used in different states and on various soil types; results have ranged from no yield increase to 50 percent increase. For instance, in 1953 and 1954 the Georgia Experiment Station tried the method of skipping every third row and obtained yields on the actual planted acreage ranging from nine percent decrease to 33 percent increase. In a study at Osceola, Ark., in 1956, the use of four rows planted and four rows fallowed increased yield by 13.5 percent, or 260 pounds of seed cotton per acre.

Early in 1956 the Agricultural Stabilization and Conservation Committee ruled that credit could be allowed for the fallowed or idle area in a cotton field with a minimum width of 13 feet 4 inches. This minimum width is equal to four 40-inch rows, the row spacing most commonly used in mechanized cotton farming. The ruling opened the way for using the method of alternately planting four rows and skipping four rows. A farmer planting a 20-acre field to this method would thus be charged with only 10 acres of cotton under the acreage control program.

In the Yazoo-Mississippi Delta the use of four planted rows and four skipped rows began in a small way in 1955. On one large plantation, where accurate records were kept, the increases in yield of the two outside rows of the four-row plots over the two inside rows ranged from 24 to 58 percent on several different soil types. The estimated yield increases of skip-row planting over solid planting ranged from 25 to 60 percent. This year 100 or more farmers are using this four and four method of

planting on an estimated 15,000 acres in the Delta.

• **Five-Year Study**—Realizing that this method of planting might fit into the mechanization of cotton in the Delta area, in 1956 the Delta Experiment Station at Stoneville set-up a five-year study to evaluate the practice and also to measure the effect of outside or border rows. The study, located on a good cotton soil classed as Dubbs silt loam, included replicated four-row and two-row cotton plots with four-row and two-row fallowed plots on each side, and eight-row solid planted cotton plots, the four middle rows of which were harvested for yield. The planted rows were fertilized with anhydrous ammonia at the rate of 90 pounds of nitrogen per acre.

The Delta experienced a very dry season in 1956, with unusually high temperatures from Aug. 2 to Aug. 20. Under these conditions the four-row planted plots showed a 35 percent increase over the solid planting at the first picking on Aug. 29, and a final increase of 73 percent in total yield over the solid planting was obtained. Outside rows produced 3,700 pounds of seed cotton per acre, or approximately 130 percent more than the 1,616 pound yield of the solid planting. The inside rows of the four-row plots produced 1,884 pounds per acre which was 268 pounds or 16 percent, better than the solid planting. These yield increases, during a growing season when moisture was limited, were undoubtedly due to additional moisture from the fallowed plots. More sunlight and better air circulation along the border rows may also have been important.

From the results of this study in 1956 it appears that skip-row planting could be used in two ways. First was by planting four rows and skipping four rows, wherein the four skipped rows would be counted as unplanted land and credited to acreage control. A yield increase of 73 percent was obtained in this way. The other way, the mechanics of which would have to be carefully worked out, is to use an arrangement of alternate two rows planted and two rows fallowed, thus making every row an outside row. According to the present ASC regulations the fallowed rows would not be credited in acreage control. However, with a yield increase of 130 percent over solid planting, this method has possibilities and is being seriously considered by a number of farmers.

In 1957 cotton was planted on the plots which were fallowed in 1956, and the 1956 cotton plots were fallowed. This rotation of planted and fallowed land would probably be used in a continued program. As 1957 has been a wet year without any shortage of soil moisture, any increase must be attributed to sunshine or light and to air circulation along the border rows. Due to lateness of maturity and delayed harvesting, estimates of yield increases on other four and four plantings in the Delta have not been obtained, but several farmers who are using this method have reported that their yields will be satisfactory.

In addition to increased production on limited acres, there are other possible advantages that may be gained from skip-row planting. Control of weeds and the eradication of Johnsongrass can better be accomplished by fallow; continuation of four and four planting and rotating the fallowed plots each year could help control the weeds and Johnsongrass. Whatever benefits are derived from fallowing land for a year would also accrue.

• **Cost Study** — There are also disadvantages in skip-row planting. The main one is increased cost of production per acre of cotton land. Two members of the Department of Agricultural Economics at the University of Arizona kept accurate records of the increase in costs associated with skip-row planting. Cultivation cost was 40 percent more, and insecticides and their application cost 66 percent more than with conventional plantings. The cost of irrigation, ditch labor, and water was 80 percent higher. Total cost of production was $144 an acre for skip-row planting against $103 for the solid planting, a difference of $41 an acre, or 40 percent increase. Using a net value of $110 a bale and on land normally producing two bales an acre these workers found that skip-row planting was profitable where a yield increase of one-half bale per acre or more is possible.

The Arizona study was made in the irrigated cotton area where high yields are the rule and where it seldom rains during the harvesting season. To our knowledge, no cost studies of this relatively new practice have been attempted in the Rain Belt. But the same increased costs would enter the picture in the Rain Belt, with the exception of irrigation costs. Where supplemental irrigation is used in connection with skip-row planting those cost items would also increase. Some of the equipment now used in normal cultivation, insect control and defoliation can be adopted to use in skip-row planting and hold production costs to a minimum, but it is inevitable that these costs will be greater than expenses involved in solid planting. Also, careful supervision in preparation, fertilization and planting will be necessary.

Houston in 1958

The Beltwide Cotton Production Conference next year will be held at the Rice Hotel in Houston, Dec. 18-19, it was announced at the close of the 1957 meeting.

• **Skip-Row Planting Pays**—Answering the question "Does skip-row cotton planting have a place in the Rain Belt?", we feel that it does, to some extent, but the extent of use is limited by consideration of these factors: First, as long as the ASC Committees have the requirement of four-row minimum width space in order to use this as an acreage control measure, there will be a limit to the farms which can actually practice the method; secondly, unless a large proportion of a farm is good cotton land, the operator cannot afford to put one half of the necessary acreage in fallow; thirdly, if the land can be planted to alternate crops and produce net returns which might exceed the net returns of skip-row over solid-planted cotton the farmer could prefer to use the alternate cash crop.

Since the net profit for many farm operation determines the economic value of that operation, the net profit that can be derived from skip-row planting will determine the usefulness of this method of cotton planting. In the last analysis the amount of available land, land use practice, and good farm management must necessarily determine the place of skip-row planting in the Rain Belt. ◆ ◆

Production

A Successful Farmer's Program

JAMES HAND, JR., producer, Rolling Fork, Miss.

The farms with which I have experience vary in size from 400 to 1,700 acres of cultivated land. There are five operations within this range. They are all located in the Delta area of Mississippi and are multiple-crop enterprises, with cotton receiving the major emphasis. Present acreage in cotton is less than 30 percent of the total and is determined by the government allotment. The highest percentage in cotton in previous years was 50, with soil type and balance among crops being the determining factors. The productive effort with cotton is always more intensive and the per acre cost the highest of any crop.

Other crops to give balance to the operations are soybeans, corn and oats. The balance between the crops contributes to the optimum utilization of the labor force and as nearly full employment as the seasonal nature of farming allows. All labor is on a day wage basis.

There is no livestock on these farms other than that belonging to managers and employees.

• **Complete Mechanization** — All Crops are as completely mechanized as possible. The exception is a small amount of hand labor for hoeing and about 10 to 15 percent of the cotton is picked by hand to give employment and additional income to the families of the machine operators. It could easily be harvested by machines but we are glad to make this concession to the desires of our workers. There is about one family to each 100 acres of crop land.

The efficiency and economy of mechanization result from the better tools provided the worker and the advantage, in both the efficiency and economy, of machines as compared to animal power and hand labor.

The basic unit for cotton production is the four-row cultivating tractor with all the tools necessary for disposal of plant residue, subsoiling, breaking, bedding, fertilizer application, planting, cultivating, insecticide application and flame cultivating. Harvesting is done by machine. Breaking is usually done with two-way moldboard and reversible disk plows to a depth of 12 inches when soil conditions allows. These plows throw the furrow in one direction and maintain the level condition of the fields, whereas the one-way type makes ridges, backfurrows and sinks. The two-way plow, we feel, is absolutely necessary where irrigation is planned.

• **Land Forming** — We are forming our land in an extended program that will adjust to the cropping system. Land forming greatly improves the drainage of the fields and is of great benefit to irrigation. All fields are subsoiled after

forming and are then flat broken and bedded with three- to five-row middle-breakers. An effort is made to subsoil all of the sandy-loam and light-silt loam soils every year. Fallow plowing is done twice during the summer with breaking plows followed by toolbar field cultivators.

After the cotton land has been bedded, anhydrous ammonia is applied during the spring as deeply as possible and offset from the drill. Planting is done with a four-row planter mounted on the rear of the tractor and a four-row cultivator mounted on front. The cultivator has three feet to each row with one of the sweeps being centered in the row. This combination sweeps off the top of the bed to a uniform height of about three inches and makes a fresh, firm, moist seed bed in which to put the seed. This job, done with one tractor and one man, eliminates a lot of disk and peg harrowing and conserves soil moisture. The planter is equipped with a narrow tamper wheel which presses the seed firmly into the seed trench just before it is covered. The press wheel then presses the soil on top of the drill. Planting is at the rate of 65 pounds of delinted and treated seed of adaptable varieties. Row width is 40 inches.

We are not presently using any pre- or post-emergence chemicals for grass control except to continue experimentation. When the cotton is up to a stand it is cross-cultivated on 40 inch centers and left in hills from 8 to 11 inches in length. The cultivators are run at an angle of 90 degrees. Cultivating is then done in both directions until the plants are large enough to stand flaming. The hills are never thinned. Hoeing usually begins the latter half of May.

Cultivation in both directions maintains sufficient grass control so that the hoe hands in the machine operators' families can do all of the hoeing required. This was the case even when 50 percent of the land was in cotton. The hoeing operation can be extended longer than with drill cotton. By this method, which we have followed for over 20 years, the man hours of hoeing necessary are about 15 per acre—frequently less. As a result, the cost of hoeing and flaming has been less than any for chemical methods yet tried.

Cultivation is done as required. Under some conditions, such as excess moisture in some types of soil, the top few inches of seedbed are compacted by the traffic down the middles. In this case, shallow chiselling is done in the middles behind the tractor wheels. This allows penetration of water from later rainfall or irrigation.

We have undertaken a long range plan of working into a program of supplemental irrigation. It is more effective on fields which have been formed, but we are also doing some irrigating by means of row direction and gated pipe. Results in 1956, even on land that was unformed, were an increased yield of 165 pounds of lint per acre at an additional expense of $19.49 and a lowered cost of production from 22.75 cents to 20.66 cents per pound. The yield of the irrigated cotton was 948 pounds.

• **Early-Season Insect Control** — Poisoning is done on regular schedules as recommended by the Experiment Station. There is particular emphasis on early weevil control to thwart the build-up to rates of infestation that are more difficult to control later. Insecticides are applied by ground machines and planes. In recent years, with heavier rates of fertilizer application and irrigation, insect control and defoliation have cost about $35 an acre.

The extended fruiting period resulting requires an extended control program. The added cost is easily justified, even under conditions of rainfall such as we have had this fall, which erased much of the benefit obtained. Losses from boll rot this fall have been as much as a bale of lint per acre and the seed has been badly damaged. Defoliation is always necessary when the stalks are vigorous and large.

Machine picking starts when 50 percent or more of the bolls are open. A second picking usually completes the job. The ends of rows are picked by hand. This gives plenty of room for the picker to straighten out after turning.

Since the quality of the lint can be so adversely affected by field conditions and the adjustment of the picker, great care is exercised to maintain fields free of weeds and grasses. Picking is not started in the mornings until the dew is off. Adjustments are made on the machine to get the most efficient harvest and the cleanest possible trailer sample. Gins have to have a good sample in order to turn out a good bale sample. On account of the humidity in our acres, the bloom does not stay on the cotton long but in spite of color loss, our grades in a normal season usually average Strict Low Middling Bright.

• **Cost Accounting** — As a general practice we carry out every operation of cotton production so as to get the best yield. This means that expenses are determined by the needs of the occasion. The total of expenses is calculated on an acre basis. This total is then broken

down into about 20 items of expense. Our purpose is to do enough accurate cost accounting to evaluate the cost of each material or process that goes into the making of the crop.

Under the heading "materials" are included the cost of poison, (including cost of airplane application) seed, fertilizer and the butane for flaming. Under "pre-harvest labor" are the separate amounts for preparation, cultivation and hoeing. Under "harvesting" are the items of machine labor, hand picking, cotton picker repairs, depreciation of harvesting machinery and custom harvesting. Under "unallocated costs" are the items of fuel, repairs and supplies and production machinery depreciation. Under "overhead" are the items of building depreciation and repairs, insurance and taxes, management and truck expense and a catch-all called "other." The items under these last two categories of "unallocated costs" and "overhead" are general in nature and are not readily segregated to the different crops at the time entries are made in the ledgers. At the end of the year they are calculated and distributed to the separate crops on the basis of the number of tractor hours required to make these crops.

In order to get the per pound cost of producing lint the net amount obtained from the seed after deducting the custom cost of ginning is subtracted. This will be a variable figure depending upon the price of seed but is the only way we know to handle it. This figure is then divided by the pounds of yield per acre to give the net unit cost per pound of lint. The increasing costs of the inputs have been changing with the years and there are variations between the different operations. These, together with the wide variations in yields, give a violently fluctuating unit cost as evidenced by the accompanying table.

OPERATION X	COST PER ACRE	YIELD	COST LB.
1953	113.27	730	15.10
1954	115.43	426	28.60
1955	135.73	441	31.00
1956	182.48	822	22.20
OPERATION Y			
1953	104.60	584	17.90
1954	98.37	372	26.40
1955	126.27	384	33.17
1956 Nonirrigated	178.16	783	22.75
1956 Irrigated	195.85	948	20.66

* An important footnote to these tables is the fact that 1954 was a disaster year in that it was the fourth of excessive drouth and the driest of the four. 1955 was excessively wet in July and coincided with the immunity the weevil developed to the organic insecticides.

We hope that our costs per acre of the current crop will be lower than in 1956. Until Sept. 1, yield prospects were about the same as for 1956, which would make for a slightly reduced cost per pound. But we had more than 20 inches of rain in September and October so that yields will be curtailed sharply. We shall strive to attain a per pound cost of about 20 cents. Whether or not this is in the realm of reasonable expectation, your guess is as good as mine. ◆ ◆

Council Meeting

(Continued from Page 11)

Thompson, Mesilla Park, N. M.; and C. D. Tuller, Atlanta, Ga.

Harry B. Caldwell and Sydney M. Cone, Jr. both of Greensboro, N.C., and E. J. Cecil of Fresno, Calif., were named advisory members of the Utilization Research Committee.

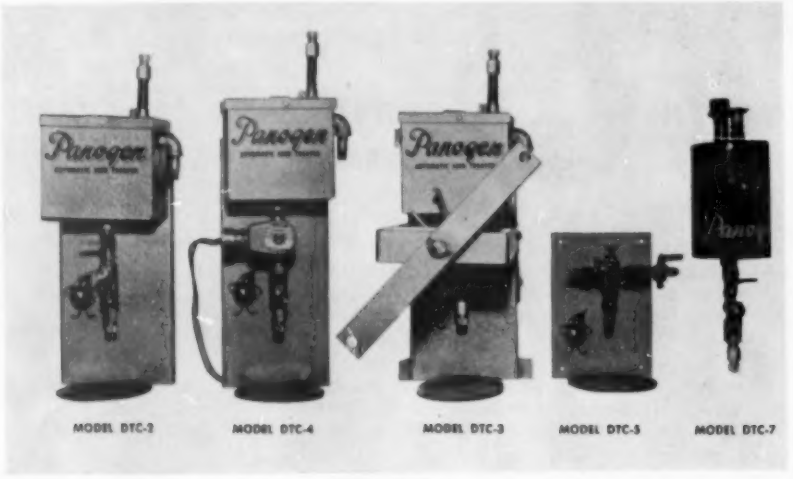
Sales Promotion—W. B. Coberly, Jr., Los Angeles, chairman; J. Craig Smith, Sylacauga, Ala., vice-chairman; R. M. Blankenbeckler, Fresno, Calif.; M. M. Bryan, Jr., Jefferson, Ga.; G. C. Cortright, Jr., Rolling Fork, Miss.; W. L. Gatz, Jr., Paragould, Ark.; C. A. Harvin, Jr., Summerton, S.C.; Marion W. Heiss, Greensboro, N.C.; C. P. Key, Lodge, S.C.

Sam LaFaver, Watonga, Okla.; J. B. Mayer, Phoenix, Ariz.; Edwin J. Neufeld, Wasco, Calif.; Ralph R. Norman, Fort Deposit, Ala.; Harold F. Ohlendorf, Osceola, Ark.; Allison H. Pell, Charlotte, N.C.; William E. Reid, New York, N.Y.; Wm. King Self, Marks, Miss.; John W. Walker, Waynesboro, Ga.; and C. W. Wallace, West Monroe, La.

Advisory: H. R. Gill, Evanston, Ill.; Mitchell Landers, El Paso; W. Ralph MacIntyre, Wilmington, Del.; Bernard H. Tholen, New York City; and R. E. L. Wilson, III, Wilson, Ark.

Foreign Trade—Hugo Dixon, Memphis, chairman; A. E. Hohenberg, Memphis, vice-chairman; James S. Francis, Phoenix; F. E. Grier, Greenwood, S.C.; R. Lindsey Gunn, Shafter, Calif.; R. T. Hoover, Jr., El Paso; Burris C. Jackson, Hillsboro, Texas; R. H. Jewell, Chickamauga, Ga.; E. G. McKenzie, Jr., Macon, Ga.; E. L. Puckett, Amory, Miss.; Walter L. Randolph, Montgomery, Ala.; Wilmer Smith, Wilson, Texas; J. H. West, Bishop, Texas; and J. Clyde Wilson, Buckeye, Ariz.

Advisory: Marc Anthony, Dallas; D. W. Brooks, Atlanta; C. A. Cannon, Kannapolis, N.C.; Everett R. Cook, Memphis; Lamar Fleming, Jr., Houston; W. A. McGregor, New York City; Alan G. Patteson, Jonesboro, Ark.; Jack J. Stoneham, Dallas; Howard Stovall, Stovall, Miss.; J. W. Tapp, Los Angeles; and S. Y. West, Memphis.



Panogen Offers Conversion Kits

FIVE INEXPENSIVE "dust-to-Panogen" conversion kits, shown here, are offered by the Panogen Co., Ringwood, Ill. With the help of one of these kits, the owner of a dust treater, grain-loading auger, or any other system which adequately mixes seed, may now use liquid Panogen seed treatment. These kits are Models DTC-2, DTC-3, DTC-4, DTC-5, and DTC-7. Model DTC-2 is designed for gravity feed from elevated drums or containers. It consists of a panel with constant-level reservoir, shut-off valve, sight-feed needle valve for metering liquid, drum fixtures, hose, and fittings. It may be used on any standard dust treater or grain auger. Models DTC-4 and DTC-3 are designed primarily for use where the container of liquid is in high or otherwise inaccessible location. The DTC-4 is equipped with an electrically controlled and the DTC-3 with rope-controlled shut-off valve. Model DTC-5 has no reservoir since the liquid is circulated by use of a pump rather than gravity. The DTC-7 is recommended mainly for farm use or low-volume custom treating. Mounted directly on the shipping container, it meters and delivers liquid to a grain auger or other grain-moving device through a hose. Information is available from Panogen Co., Ringwood, Ill., in Bulletin No. 7-35; or from The Cotton Gin and Oil Mill Press, P. O. Box 7985, Dallas 26.

Estes D. Harris, Sr., Dies

Estes Donahue Harris, Sr., lifelong resident of Duncan, Miss., died Dec. 10 at his home of a heart attack. He was 62.

He owned and operated a farm and was a cotton buyer.

He leaves his wife, a daughter, Mrs. Taylor Stone of Clarksdale, and a son, E. D. Harris, Jr., Houston, Texas.

Soybean Yields Good

Soybean yields of 20 to 41 bushels per acre are being made in Floyd County, Texas, County Agent Cecil Lewis reports. Nearly 200 farmers planted about 5,000 acres.

W. O. FORTENBERRY

Cotton Leaders Honored

TWO TEXANS who have contributed much to cotton share 1957 honors as "Men of the Year in Texas Agriculture," as chosen by The Progressive Farmer. W. O. Fortenberry, Lubbock, president of Plains Growers, past president of Texas and National Cotton Ginners' Associations and leader in many cotton programs, richly deserves recognition. So does Byron W. Frierson, head of agricultural operations for the Texas Prison System—while saving millions of dollars for Texas taxpayers, he has proved that efficient cotton production pays and has made his operations model cotton demonstrations for farmers throughout the state.

BYRON W. FRIERSON

Agriculturists To Meet

"Texas Agriculture in 1970" is the theme for the Texas Agricultural Workers' Association convention on Jan. 9-10.

Garlon A. Harper, Dallas, director of research and education for National Cottonseed Products Association, is secretary.

• Plains Gin Leaders Comment on Fires

GIN FIRES on the South Plains of Texas this season may have been the worst in history, industry leaders report. Comments published by the Lubbock newspaper include the following:

Roy Forkner, Lubbock County ginner and president of the Texas Cotton Ginners' Association, said: "I am sure the ginners as well as the farmers will be glad when this one (1957 crop) is completed. Backlogs are as high as I have ever seen them. Everybody is working around the clock."

Forkner said he believed that, collectively, damages from cotton fires this fall have been as great as any year in history.

Earl Hobbs, Lubbock, president of the Plains Ginners' Association, added to Forkner's statement, saying: "man for man, we have been as busy this ginning season as we have ever been."

New Bulletin

SHOULD PLANTS LEASE EQUIPMENT?

"Should Your Plant Lease Production Equipment?" is the title of Leaflet No. 57, available from offices of the Small Business Administration, which has headquarters in the Lafayette Building, Washington.

Six major advantages and four disadvantages of leasing rather than buying equipment are discussed in the publication.

Classified Advertising

RATES AND CLOSING DATES: Ten cents per word per insertion. Include your firm name and address in making word count. Minimum charge $2.00. Copy must be in our hands by Thursday morning of week of issue. Please write plainly.

Oil Mill Equipment for Sale

FOR SALE—Filter presses, screening tanks, single and twin motor Anderson Super Duo expellers, 141-saw linters, baling presses, car unloader, Bauer #199 seed cleaners, Bauer #153 and 403 separating units, bar and disc hullers, 72" and 85" stack cookers, 72" 4-hi stack cookers for French expellers with enclosed drive, 42" and 60" rolls, boilers, hydraulic press room equipment.—V. A. Lessor & Co., P. O. Box 108, Fort Worth, Texas.

INSPECTIONS and appraisal. Dismantle and installation.—Oscar V. Shultz, Industrial Engineering, Phone BUtler 9-2172, P. O. Box 357, Grapevine, Texas.

FOR SALE—Anderson Duplex Super Duo 36" cooker twin motor expellers, 42" and 36" filter presses, oil refining equipment, oil screening tank, five-high cracking rolls, scale tanks complete with Toledo scales, Richardson scales, meal coolers, Prater pulverizers, pumps and motors. All in A-1 condition. Contact Lee Atherton of Archer Daniels Midland Co., Minneapolis, Minnesota.

OIL MILL EQUIPMENT FOR SALE — Rebuilt twin motor Anderson high speed expellers, French screw presses, stack cookers, meal coolers, fourteen inch conditioners, filter presses, oil screening tanks, complete modern prepressing or single press expeller mills.—Pittock & Associates, Glen Riddle, Pa.

FOR SALE—Anderson Super Duo expellers. Filter presses. D-K 90" 5-high all-steel cooker; 2 French 5-high 72" expeller cookers. Bauer 199—60" seed cleaner. Bauer 153 separating unit. Butters milling machine. Carver 176-saw Tru-line gummer. Carver double-drum hull heater. 141-saw Carver linters. Double-box linter press. Bar hullers. Attrition mills. 20" to 80" fans. Motors: 75 h.p. and under. Starting boxes and switches.—Sproles & Cook Machinery Co., 159 Howell St., Dallas, Texas. Telephone RI-7-5958.

FOR SALE—California Century pellet mill, 50 h.p., 5 years old, complete with cooler, shaker screen, dies, pellet tank, and crumbling mill. Three steel elevators, 6 x 4 cups, rubber belt, two 22' lifts, one 17' lift. Horizontal all-steel batch mixer, 3000 lb. capacity. Niagara Gyro-whip feed dresser.—Swift and Company Oil Mill, P. O. Box 1356, Fort Worth, Texas.

Gin Equipment for Sale

FOR SALE—5-80 Lummus gin stands and 1949 Model Lummus Thermex feeders. Completely overhauled and in excellent condition throughout.—Owens Co-op Gin, Ralls, Texas.

FOR SALE—Any part of complete 5-80 Lummus automatic gin machinery, very good condition. Write Kollaja Gin Co., P. O. Box 272, Ganado, Texas, or phone Joe Kollaja at 3185.

FOR SALE AT BARGAIN—Complete all-steel 4-80 Lummus double moting gin powered by one 35 h.p. and one 75 h.p. electric motors, 1946 series stands, including 1949 model Lummus all-steel down-packing press and tramper, all-steel Mitchell conveyor-distributor. Operated during 1957 season. For information call Jefferson 5-0032, Pine Bluff, Arkansas, or write H. Cox, 1715 Cherry Street, Pine Bluff, Arkansas.

FOR SALE—Gin stands: 5-80 saw Murrays with glass fronts, 6" mote conveyor, new gin ribs and huller ribs. 4-80 saw double moting automatic Lummus. Lint cleaners: 5 Murray A.B.C.'s—like new. Feeders: 5-67" Continental 4-X. 4 Hardwicke Et'er 66" with 4-cylinder after cleaners. 5-60" Super Mitchells. Driers: One No. 18 Murray Big Reel.—Kimbell Used Gin Machinery Co., Box 456, Earth, Texas.

FOR SALE—One complete Murray gin with 24-shelf tower drier and 220 h.p. MM gas engine. Perfect condition. Will sell to be moved or to be run. This gin closed this December, 1957, due to manager's retirement. Write or call Vernon Schrade, CHurchill 5-3304 or CHurchill 5-3347, Rowlett, Texas.

FOR SALE—3-80 Continental F2 gins, Continental ram and belted pump.—R. C. Kobel, Box 819, Fort Smith, Ark.

FOR SALE—Complete 4-80 saw air blast Model C gins, all-steel up-packing paragon press, E.J. tramper, triplex pump base tank and cover, all Continental. Press alone worth the price of the outfit—$7,500.—James C. Mann, phone 2267, Covington, Ga.

FOR SALE—Modern 4-90 Continental, located in best cotton country of Coastal Bend of Texas. Recent heavy rains assure bumper crop. Includes residence, labor house, office and seed house. Price $75,000. Other interests.—Box JT, The Cotton Gin and Oil Mill Press, P. O. Box 7985, Dallas 26, Texas.

FOR SALE—Complete gin plants. Second hand and reconditioned gin machinery.—Sam Clements, Phone REgent 5-3764, West Memphis, Arkansas.

FOR SALE—Gins: 4-80 Continental F3 brush, 5-90 Gullett, 4-80 Continental Model C brush with 30 fronts, 3-80 Model C brush, 7-80 glass front Murrays and lint flue for 4, 4-80 glass front Lummus and lint flue, 1-80 Continental Model E brush, 1-80 1949 Lummus. Huller cleaner feeders: 7-80 Continental Double X, 4-80 Lummus LEF's, 1-80 Lummus MEF. Cleaners: 1-52" 8-cylinder V-drive Stacy, 1-52" 6-cylinder Murray blow-in type, 1-8' wide 6-cylinder Lummus, 1-52" Hardwicke-Etter, 1-52" 4-cylinder Continental. Driers: 2 Murray Big Reels, one 16-section Lummus Thermo-cleaner. Separators: 2-72" Murrays, 1-52" Murray, 1-52" Continental, 1-52" Gullett, 1-38" Stacy, 1-72" Lummus. Bur machines: 1-14' all-steel, V-drive Lummus, 1-14' wood Hardwicke-Etter. Engines: One V-8 Le Roi, one Twin Six MM. Electric motors and fans in various sizes.—Bill Smith, Box 694, Phones OR-4-9626 and OR-4-7847, Abilene, Texas.

SPECIAL BARGAINS—All-steel double box up-packing Hardwicke-Etter press. Four 9" rotor lifts, like new. Late model 4-90 Mitchell conveyor distributor. Steel cleaners: 6-cylinder Stacy, 7-cylinder 50" Hardwicke-Etter V-belt driven, 4-cylinder Continental, 8' Lummus 4-cylinder after cleaner, 5-cylinder and 7-cylinder 50" blow-in type Gulletts. Five Murray saw type and four 1949 model Continental lint cleaners. Mitchell convertible and Super units in 60" and 66" lengths. Two trough Continental, Murray Big Reel and 14-shelf Gullett driers. New tower driers in any size. 10' and 14' Lummus and 14' Gullett late model steel bur machines. 48" type M and cleaner type Lummus, 50" Gullett, 70" Hardwicke-Etter and two 52" Murray VS steel separators. New and used single and double fans, belting, conveyor trough and a general line of transmission equipment. For your largest, oldest and most reliable source of used and reconditioned gin machinery, contact us. Call us regarding any machinery or complete gin plants which you have for sale or trade.—R. B. Strickland & Co., 13-A Hackberry St., Phones: Day PL-2-8141, Night: PL-3-7929, Waco, Texas.

Equipment Wanted

WANTED—We need a few modern gin plants to sell. 4-80 or 5-80 saw Continental, Murray and Lummus outfits. 4-90 saw or 5-90 Continental, Murray and Lummus outfits. Must be modern plants to move. Call or write Sam Clements, Phone REgent 5-3764, West Memphis, Ark.

WANTED TO BUY—Any kind of used gin machinery. Comercial e Industrial del Pacifico C.A., Box 4841, Manta, Ecuador, South America.

WANTED—Complete gin plants and used gin machinery.—Sam Clements, West Memphis, Ark.

Power Units and Miscellaneous

FOR THE LARGEST STOCK of good, clean used gas or diesel engines in Texas, always see Stewart & Stevenson Services first. Contact your nearest branch.

SEE US for good used re-built engines, MM parts, belt lace, and Seal-Skin belt dressing.—Fort Worth Machinery Company, (Rear) 913 East Berry Street, Fort Worth, Texas.

FOR SALE—40 h.p. Moline or Buda power units for gas or butane, some for gasoline, all rebuilt, good as new. R61 Climax 150 h.p. with silent chain drive, gasoline or butane carburetor. Need 4-70 or 4-80 Murray stand with lint flue. Will swap.—Manofsky Gin Co., Phones: C5-3698 or C5-2422, P. O. Box 630, Bay City, Texas.

FOR SALE—14' Graham Hoeme plow, heavy duty, double tongue, single cylinder hydraulic lift, all like new condition, $585. Also one No. 99 International five disk plow, $375.—W. A. Caplis, Box 1312, Shreveport, La.

• Processing Clinic Program Complete

THE PROGRAM for the seventh annual Cottonseed Processing Clinic at Southern Regional Research Laboratory, New Orleans, is announced by the sponsors. The Clinic will be held Feb. 3-4.

James Hicky, president, Valley Oilseed Processors' Association; and Dr. C. H. Fisher, director, USDA Southern Utilization Research and Development Division, announced the plans. Hotel reservations should be made through E. A. Gastrock, SURB, P.O. Box 7307, New Orleans 19.

Participants on the program will include, in addition to Hicky, Gastrock and Fisher, G. E. Goheen, USDA; V. L. Frampton, USDA; Carl Lyman, Texas A&M; Garlon A. Harper, National Cottonseed Products Association; H. L. Wilcke, Ralston Purina Co.; A. M. Altschul, USDA; W. G. Quinn, Buckeye Co.; E. F. Pollard, USDA; Ralph Woodruff, Delta Products Co.; Frank G. Dollear, USDA; Scott McMichael, USDA; W. C. Whittecar, Plains Cooperative Oil Mill; C. L. Hoffpauir, USDA; P. H. Eaves, USDA; J. J. Spadaro, USDA; Tom S. Pryor, Continental Gin Co.; J. B. Perry, Jr., Mississippi Oil Mills; Allen Smith, Perkins Oil Co.; Robert F. Patterson, Trenton Oil Mill; Lawrence H. Hodges, Barrow-Agee Laboratory; M. E. Ginaven, Bauer Brothers Co.; Jim Brawner, Southern Cotton Oil Co.; Frank Barlow, USDA; L. L. Holzenthal, USDA; M. C. Verdery, Anderson, Clayton Co.; and H. L. E. Vix, USDA.

• 1958 To Bring Only "Recessionette"

NEXT YEAR will bring more business adjustments, but only a "recessionette."

This is the forecast of J. Carvel Lange, president of Industrial Commodity Corp. The firm, which is celebrating its twenty-fifth anniversary, specializes in cottonseed oil and meal price analysis. "Although we'll probably have more adjustments, we are not likely to experience a serious recession—not even a 'depressionette,'" Lang said in a business outlook statement. His comments, in part, were:

"In 1957, investment, production, income and consumer spending all have registered gains, but at the cost of imbalances. Expansion has now stopped and no major new force is stimulating further growth. As in late 1953, business again appears on a high but slippery plateau with a slight downward tilt . . .

"For the first half of 1958, a loss of several points in the industrial production index seems probable together with some decline in industrial employment, in the gross national product and in commodity prices (more noticeably at wholesale than at retail). Unemployment, may rise to around four to four and one-half million, or about six percent of the labor force, by next spring.

"The second half of the year should bring an upturn in defense spending, higher wage rates from next summer's labor negotiations, some reversal of downward inventory corrections, and generally easier credit. A revival in overall business activity should occur during the latter part of the year, but only on a modest scale in the absence of additional stimulants beyond those now foreseeable . . .

"In over-all terms, 1958 portends a delicate balance between positive and negative elements with plus factors slightly outweighing minus for the year as a whole. 1958, therefore, promises to be another year of rolling readjustments and sharpening competitive pressures—a 'recessionette' only."

Meeting Dates Changed

Oklahoma Cooperative Ginners' Association will meet Jan. 28 instead of Jan. 21, as previously planned. Wilmer Smith, Wilson, Texas, will speak at the meeting, to be held in the American Legion Building at Hobart.

CALENDAR

Conventions - Meetings - Events

12	13	14	15	16	17	18

1958

- **Jan. 13-14—National Cotton Council annual meeting. Westward Ho Hotel, Pheonix, Ariz. For information, write Council headquarters, P.O. Box 9905, Memphis.**
- **Jan. 21—Cooperative Ginners' Association of Oklahoma annual convention. American Legion Building, Hobart. Mrs. Lucile Millwee, P. O. Box 631, Carnegie, secretary-treasurer.**
- **Feb. 3-4—Cottonseed Processing Clinic. Southern Regional Laboratory, New Orleans. Sponsored by USDA and Valley Oilseed Processors' Association. C. E. Garner, 416 Exchange Building, Memphis, Association secretary.**
- **Feb. 10-11—Annual joint convention, Texas Cooperative Ginners' Association, Texas Federation of Cooperatives and Houston Bank for Cooperatives. Baker Hotel, Dallas. For information, write Bruno E. Schroeder, 307 Nash Building, Austin.**
- **Feb. 10-11 — Southeastern Gin Suppliers' Exhibit. Biltmore Hotel, Atlanta. For exhibit information, write Tom Murray, 714 Henry Grady Building, Atlanta. Concurrent with joint meeting of Alabama-Florida, Carolinas and Georgia Cotton Ginners' Associations.**
- **Feb. 10-11 — Joint convention, Alabama-Florida, Carolinas and Georgia Cotton Ginners' Associations. Biltmore Hotel, Atlanta. Tom Murray, 714 Henry Grady Building, Atlanta, executive vice-president, Alabama-Florida and Georgia Associations. E. O. McMahan, Bennettsville, S.C., executive secretary, Carolinas Ginners' Association. Meeting concurrent with Southeastern Gin Suppliers' Exhibit.**
- **Feb. 12-14—Cotton Research Clinic. Pinehurst, N.C. For information, write the National Cotton Council, P. O. Box 9905, Memphis 12.**
- **Feb. 27-28—Oklahoma Cotton Ginners' Association annual convention. Skirvin Hotel, Oklahoma City. Edgar L. McVicker, 307 Bettes Building, Oklahoma City, secretary-treasurer**
- **March 4-5—Western Cotton Production Conference. Hotel Cortez, El Paso, Texas. Sponsored by Five-State Cotton Growers' Association and National Cotton Council.**
- **March 7-9—West Coast Division, International Oil Mill Superintendents' Association. Lafayette Hotel, Long Beach, Calif.**
- **March 10-12 — Midsouth Gin Supply Exhibit. Midsouth Fairgrounds, Memphis. Sponsored by Arkansas-Missouri Ginners' Association, Tennessee Ginners' Association and Louisiana-Mississippi Ginners' Association, which will have annual meetings in conjunction with Exhibit. For information on exhibit, write W. Kemper Bruton, P. O. Box 345, Blytheville, Ark.**
- **March 10-12 — Joint convention, Arkansas-Missouri, Tennessee and Louisiana-Mississippi Ginners' Associations. Memphis, Tenn. Held in conjunction with Midsouth Gin Supply Exhibit. W. Kemper Bruton, Blytheville, Ark., executive for Arkansas-Missouri Association; Gor-**

don W. Marks, Jackson, Miss., executive for Louisiana-Mississippi Association; and W. T. Pigott, Milan, Tenn., executive for Tennessee Association.

• April 10-11 — Cotton Merchandising Research Clinic. Commodore Perry Hotel, Austin, Texas. For information write Joel F. Hembree, P. O. Box 8020, University Station, Austin.

• April 13-15 — Texas Cotton Ginners' Association annual convention. State Fair of Texas grounds, Dallas. Edward H. Bush, executive vice-president, Dallas. For exhibit information, write Edward H. Bush, president, Gin Machinery and Supply Association, P. O. Box 7665, Dallas 26.

• April 13—National Cotton Ginners' Association annual meeting, Dallas Texas. Tom Murray, 714 Henry Grady Building, Atlanta, executive secretary.

• April 14-15—Valley Oilseed Processors' annual convention. Buena Vista Hotel, Biloxi, Miss. C. E. Garner, 416 Exchange Building, Memphis, secretary.

• April 21-23—American Oil Chemists' Society spring meeting. Memphis. For information, write AOCS headquarters, 35 East Wacker Drive, Chicago.

• May 5-6—National Cottonseed Products Association annual convention. Atlanta Biltmore Hotel, Atlanta. John F. Moloney, 19 South Cleveland, Memphis, secretary-treasurer.

• May 19-20 — Oklahoma Cottonseed Crushers' Association annual convention. Quartz Mountain Lodge, Lake Altus. Edgar L. McVicker, 307 Bettes Building, Oklahoma City, secretary.

• June 1-3—Texas Cottonseed Crushers' Association annual convention. Hotel Galvez, Galveston. Jack Whetstone, 624 Wilson Bldg., Dallas, secretary-treasurer.

• June 4-6—Tri-States Oil Mill Superintendents' Association annual convention. Edgewater Gulf Hotel, Edgewater Park, Miss. B. C. Lundy, Greenville, Miss., and Woodson Campbell, Hollandale, Miss., co-chairmen.

• June 5-7—American Cotton Congress at Harlingen, Texas, and Matamoros, Mexico. For hotel or motel reservation write: Harry Nunn, Madison Hotel, Harlingen. For general information write to Burris C. Jackson, Hillsboro, Texas.

• June 8-10—International Oil Mill Superintendents' Association annual convention. Baker Hotel, Dallas. H. E. Wilson, P. O. Box 1180, Wharton, Texas, secretary-treasurer.

• June 23-24—Joint convention, North Carolina, South Carolina and Southeastern Cottonseed Crushers' Associations. Ocean Forest Hotel, Myrtle Beach, S.C. For information, write Mrs. M. U. Hogue, 612 Lawyers' Building, Raleigh, N.C.; C. M. Scales, 318 Grande Theatre Building, Atlanta; or Mrs. Durrett L. Williams, 609 Palmetto Bldg., Columbia, S.C.

• Aug. 12-14—Beltwide Cotton Mechanization Conference. Memorial Center, Brownsville, Texas. For information, write National Cotton Council, P. O. Box 9905, Memphis, Tenn.

• Oct. 20-22—American Oil Chemists' Society fall meeting. Chicago. For information, write AOCS headquarters, 35 East Wacker Drive, Chicago.

• Dec. 18-19—Beltwide Cotton Production Conference. Rice Hotel, Houston, Texas. For information, write National Cotton Council, P. O. Box 9905, Memphis 12, Tenn.

• Research Committee Of NCPA Meets

RESEARCH COMMITTEE members and officials of National Cottonseed Products Association met Dec. 16-18 at Texas A&M College.

Committeemen present were Dr. H. L. Wilcke, James Hicky, J. M. Johnson, Dr. H. E. Robinson, Robert Stokes and P. A. Williams. NCPA staff members attending were J. D. Fleming, Garlon A. Harper, John F. Moloney and A. L. Ward. Other industry representatives were A. L. Durand and Dr. Philip Aines.

Reports on research in progress were made by local workers and others. Industry representatives discussed research with swine, cottonseed oil pigment glands, oilseed production, and research at the Southern Regional Research Laboratory.

The committee discussed future plans and toured Texas A&M facilities.

Dr. M. T. Harrington, Dr. C. M. Lyman and Dr. A. M. Altschul spoke at a dinner, at which Harper presided.

Soybean Research Council To Hold Oil Symposium

The Soybean Research Council of the National Soybean Processors' Association met in an all-day session Dec. 4, at Chicago's Congress Hotel to hear committee reports and discuss plans for future activities.

The Council then laid plans for a Soybean Oil Symposium to be held, April 24, immediately following the Oil Chemists' meeting in Memphis. Part of the Symposium will deal with the nutritional aspects of food fats and oils and part will be devoted to analytical and technical aspects.

Cotton Ginned to Dec. 13

The Bureau of Census reported 9,200,665 bales of cotton ginned to Dec. 13. Details and comparative figures follow:

State	(Running bales—linters not included) *1957	1956	1955
United States	**9,200,665	**12,815,385	**13,713,519
Alabama	521,049	743,010	1,026,770
Arizona	559,295	707,003	524,264
Arkansas	806,248	1,368,625	1,568,159
California	1,438,749	1,397,338	1,023,975
Florida	6,786	9,178	14,763
Georgia	387,227	575,060	686,782
Illinois	837	2,424	1,477
Kentucky	3,331	7,384	6,957
Louisiana	310,025	568,047	564,136
Mississippi	943,530	1,572,907	1,940,186
Missouri	148,831	438,891	396,473
New Mexico	181,505	273,158	227,891
North Carolina	230,080	352,581	351,166
Oklahoma	204,571	251,198	434,395
South Carolina	341,235	515,830	560,970
Tennessee	371,254	523,136	564,086
Texas	2,739,046	3,499,625	3,810,990
Virginia	7,086	9,990	10,079

*The 1957 figures include estimates for gins for which reports were not obtained in time for this report.

**Includes 230,756 bales of the crop of 1957 ginned prior to Aug. 1 counted in the season of 1956-57, compare with 404,845 and 313,958 bales of the crops of 1956 and 1955.

Retired Ginner Dies

William Harper Bird, 79, retired ginner of Ridgeley, Tenn., died Dec. 18 following a heart attack. He was a partner in Ridgely Cotton Co. for many years. He is survived by his daughter, one sister, two brothers, and two grandchildren.

laugh it off

A man jumped up at a business conference, shouting: "I gotta rush—there's a fire hydrant parked near my car."

• • •

Prime Minister Menzies of Australia, about to make an important decision, was asked by a reporter belonging to an opposition paper: "Do you plan to consult the powerful interests that control you in making up your mind?"

Menzies grinned: "My friend, keep my wife out of this!"

• • •

On his deathbed, Alexander Dumas, the famed French writer, was told by his disappointed son that there were only a few coins left in the family treasury.

"How wonderful," enthused the elder Dumas. "That's precisely the sum I had with me when I first came to Paris. Imagine, living like a king for half a century and it hasn't cost me a cent!"

• • •

Radio-TV writer Goodman Ace once wrote the following note to the then-Giant manager, Leo Durocher: "The public address announcer at the Polo Grounds warns spectators they must not touch a batted ball while it is in play. Please notify your first baseman that that this does not apply to him."

• • •

Reading a newspaper report that thousands of Army K-rations stored in Western Europe had spoiled, an ex-G.I. asked: "How could they tell?"

• • •

The kindly old lady had made a pair of pajamas for the Red Cross to give to some soldier. The Red Cross worker looked at the handsome clothing and noticed that the pants had no front opening. Gently the situation was explained to the donor. The little old lady was downcast at first but then she brightened up. "I have it; give them to some bachelor," she murmured sweetly.

• • •

You can always tell who the boss is. He's the guy who watches the clock during the coffee break.

• • •

Foreman: "How come you're only carrying one sack, when the other men are carrying two?"

Workman: "Well, I guess they're too lazy to make two trips, the way I do."

• • •

A nightclub is a place where they have what it takes to take what you have.

• • •

A farmer was losing his temper trying to drive two mules into a field when the minister came by.

"Say, Reverend," the farmer said, "you're just the man I want to see. Tell me, how did Noah get these into the ark?"

• • •

In the 1880's, a baseball manager posted a set of rules for his players on the locker room bulletin board. Among them was this one: "Don't get into fights or arguments with spectators. Many of them have paid as much as 10 cents to see the game."

• • •

A mountaineer on his first visit to a town of any size was fascinated by the asphalt streets. Scraping his feet on the hard surface, he remarked: "Well, I can't blame 'em for building a town here. The ground's too derned hard to plow, anyhow."

Research Improves Ginning

(Continued from Page 7)

headed match would ignite and fire the cotton 70 percent of the time in passing through one five-cylinder screened cleaner.

• **Pink Bollworm Research** — For many years gins in the pink bollworm quarantine area of Texas, New Mexico, Arizona, Arkansas, and Louisiana were required to sterilize cottonseed before it left the gin yard or as a continuous process of ginning. In cooperation with the Pink Bollworm Research Center and the Plant Pest Control Division, ginning tests were performed on highly-infested cotton. These tests showed that a gin moderately equipped would kill at least 95 percent of the worms and an elaborately equipped gin would kill up to 100 percent. These tests determined that the cotton gin played no part in the infestation within a community.

Consequently, the troublesome and costly operation of seed sterilization is no longer required in Texas and New Mexico, provided the seed do not leave the infested area. It has been conservatively estimated that discontinuation of this practice is saving the ginners and farmers of these states at least $1,500,000 per year. Seed sterilization in parts of Arizona, Arkansas, and Louisiana is still required by their State Departments of Agriculture, possibly because they are on the fringes of the infested area and much of the seed moves from infested to non-infested zones.

For many years it was customary to burn the trash for controlling pink bollworms. Trash burners are expensive, a fire hazard, inefficient, produce smoke and ashes and are a community nuisance. In connection with the previously mentioned tests it was discovered that all the worms in the gin trash are killed when the trash passed through the trash fan operated under specified conditions.

This finding permitted gins to save the trash and enabled farmers to return it to the land for soil building and for fertilizer use. This practice is quite extensive on the High Plains and is rapidly spreading in other Western areas.

• **Roller Gin Research**—Since 1953, all roller ginning research for USDA has been done at the Mesilla Park Laboratory. The mechanical harvesting of extra long staple American-Egyptian cotton presented quite a ginning problem. This extra fine long-fibered cotton has traditonally been handled very gently, carefully hand picked, and the gins have employed only a minimum of pneumatic and mechanical handling.

Studies since 1953 have shown that newer varieties, such as Pima S-1, can be dried with moderate heat and cleaned with conventional cleaning and extracting machines when employed in moderate setups and ginned with satisfactory results with no detrimental fiber damage. Many newer installations now employ a drier, cleaner, and bur extractor, followed by a second finishing cleaner. Small cleaners or extractors are generally now being installed over each gin stand. In modern gins lint is no longer manually pushed on the floor to single box presses. This out-dated method is being replaced by labor saving pneumatic or belt systems, or a combination of both, which convey the lint to condensers and double box presses. Pneumatic type cotton gin and cotton mill lint cleaners are being used satisfactorily and standard density presses are coming into the picture.

• **Some Remaining Problems**—Low ginning capacity of roller gins is still a major problem, but a long-range program of developmental research is underway at this Laboratory. It is hoped this will bear fruit in the future. Additional seed cotton cleaning research is needed for roller gins, because even though some success has been obtained with machine-picked cotton, the quality is not yet on a par with hand harvesting.

One of the major problems in this area, as well as in other areas, is cotton quality preservation. Farmers and ginners are extremely aware that quality must be preserved in order to maintain the reputation of their product. They also know that good quality involves many fiber characteristics that affect spinning performance but are not always reflected in grade and staple. In order to learn more of this problem, this Laboratory is carrying on a comprehensive study to determine the effects of ginning treatments on fiber properties as they might affect spinning mill operations, yarn and fabric qualties, ginning efficiency, and the value of the farmer's bale.

The Laboratory also is currently working on other problems. Needed are better dust control equipment and methods, together with improved trash disposal systems. There is also a big need for better measuring devices for determining moisture and foreign matter of the incoming cotton, so as to better control drier temperatures, and to enable the ginner to obtain more efficient use of his cleaning, extracting and lint cleaning facilities. Better and more economical cotton conveying methods are needed to reduce lavor and power costs.

Laboratory ginning tests are also providing data of mutual interest to other research organizations by cooperating with state Experiment Stations to study the effects of ginning on the spinning performance and fiber qualities of cottons affected by irrigation treatments, plant population, weed control practices, varieties and methods of harvesting.

Editorial

Why Pick on Ginners?

THE GINNING INDUSTRY has had a hard blow from USDA at a time when ginners have unavoidable troubles enough, without deserving any unkind cuts from their friends.

Funds for research at USDA's Cotton Ginning Laboratories have been cut. Other agricultural research—even in the same department—is getting more money. Why pick on ginners?

Industry leaders who've asked that question have had answers from USDA that leave many unanswered questions. Why, for example, hasn't agricultural engineering research (which includes the ginning work) received its share of increased funds provided for the Agricultural Research Service? Why are there fewer people and less money available for work at the USDA Ginning Laboratories at a time when cotton and ginning have a greater need for research than ever before?

Ginners and gin machinery manufacturers are well aware of the value of the experimental work done at the centers at Clemson, Stoneville, Mesilla Park and Chickasha. The industry recognizes the need for more—not less—work now and in future years.

Ginners, individually and through their organizations, apparently are going to have to get to work to fight for the help they need and merit. Someone has made a mistake in Washington; the industry hopes that USDA will recognize this and remedy the situation promptly. If not, the industry should go to work on members of Congress and others whose influence in Washington is strong enough to get the job done.

Cotton and the ginning industry must have an adequate program of ginning research. They can't have an adequate program unless the USDA Ginning Laboratories get a fair share of available funds.

Continental Gin Co. Declares Dividends

Directors of Continental Gin Co. declared a dividend of 25 cents per share on the common stock, which was paid Dec. 23, 1957, to stockholders of record at the close of business Dec. 12.

In addition to this cash dividend, directors also declared a two percent stock dividend payable Jan. 10, 1958, to stockholders of record at the close of business Dec. 12, 1957.

The regular quarterly dividend on the four and one-half percent preferred stock will be paid Jan. 2, 1958, to stockholders of record Dec. 16, 1957.

Board Chairman R. S. Lynch also announced that the expansion program, started early this year, is well on its way.

Soil Bank and weather conditions this year caused sales of gin machinery to be disappointing; however, the backlog of Industrial Division sales is quite substantial at this time.

GULLETT

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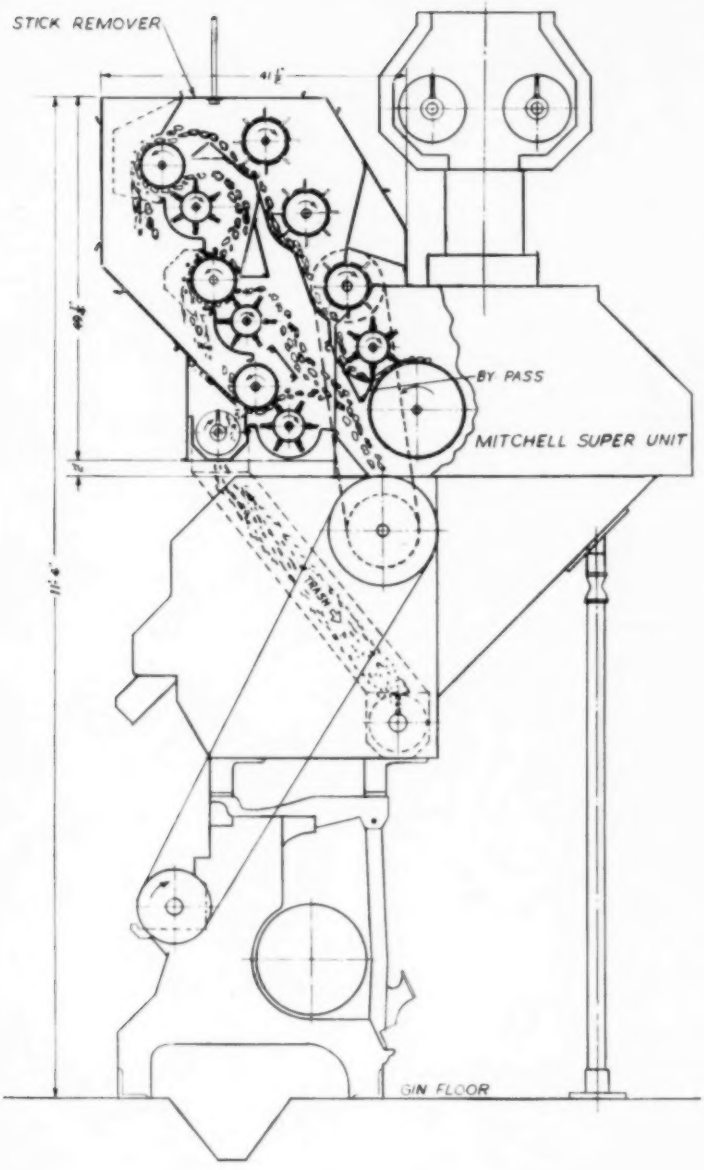

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Shown at left, USDA Designed Green Leaf and Stick Remover on Mitchell Super Units as Applied by Gullett Gin Co.

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